ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA

Vol. XI.

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ASIATIC PALMS–LEPIDOCARYEAE

By

DR. ODOARDO BECCARI.

PART I.

THE SPECIES OF CALAMUS

WITH 238 PLATES.

Mo. Bot. Garden
1909

CALCUTTA
Printed at the Bengal Secretariat Press
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"In palmis semperparens juventus;
in palmis resurgo." *Mart.*

DEDICATED

TO THE ILLUSTRIOUS MEMORY OF

William Griffith

1810–1845.

FELLOW OF THE LINNEAN SOCIETY OF LONDON; MEMBER OF THE IMPERIAL ACADEMY OF
NATURAL SCIENCES OF BONN; CORRESPONDING MEMBER OF THE IMPERIAL
BOTANICAL SOCIETY OF RATISBON, OF THE ROYAL ACADEMIES
OF SCIENCES OF TURIN AND CHRISTIANIA, AND OF
VARIOUS OTHER LEARNED SOCIETIES.

SURGEON IN THE MADRAS ESTABLISHMENT
THE HONOURABLE EAST INDIA COMPANY AND
SUPERINTENDENT OF THEIR BOTANIC GARDEN AT CALCUTTA
FROM 1842 TO 1844.

AUTHOR OF

PALMS OF BRITISH EAST INDIA.

Calcutta, March 1908.

PREFACE.

A monograph of the genera *Calamus* and *Daemonorops* was prepared by me many years ago, as part of a general work on "Asiatic Palms" which it had been my intention to publish in my "Malesia." The "Istituto di Studi Superiori" of Florence having, however, withdrawn its subsidy towards the continuation of the work intended to illustrate the Malayan botanical collections gathered by me—collections which had become the property of that Institute—my studies of the Asiatic Palms were interrupted, and only a partial use of my notes could be made by Sir Joseph Hooker in the sixth volume of the "Flora of British India."

The present monograph would probably never have seen the light had it not been my good fortune, in 1899, to meet in Florence Sir George King, who most courteously and generously offered to arrange for the publication of the work in the "Annals of the Royal Botanic Garden of Calcutta," of which publication he had been the founder. This unexpected and welcome aid enabled me, after ten years' interruption, to resume the study of the two genera mentioned, and now, thanks to the most valuable help given me by Lieut.-Col. D. Prain, the worthy successor to Sir George King in the Superintendentship of the Calcutta Botanic Garden and in the Editorship of these "Annals," this monograph of the genus *Calamus* is issued, with the hope that monographs of *Daemonorops* and of the remaining *Lepidocaryeae*, if not of all the Asiatic Palms, may follow.

In the course of my study of *Calamus* and *Daemonorops* I have had the advantage of dealing with very extensive material. No pains have been spared in bringing together specimens of these plants from their native countries. The greatest liberality has, moreover, been shown by the Directors of the leading botanical establishments, who have accorded me full opportunities of making use of the collections under their charge. As a result I have been able, except in the case of five species described and figured only by Rumph, but not met with again by modern botanists, to provide a description of my own and to take a photograph of every one of the some 200 known species of *Calamus*.

The list of those who have in various ways aided me in my work is a long one, and I cannot too heartily and gratefully acknowledge the valuable assistance I have received from so many friendly helpers; but I feel above all deeply indebted to Sir George King and to Lieut.-Col. Prain, since these gentlemen have provided me with an opportunity of publishing this work. accompanied by natural-size phototype reproductions of my negatives. I am also under much obligation to them for sets of the *Calami*, and other Palms from the Calcutta Herbarium, placed freely at my disposal whenever required. I have likewise to express my thanks to Captain A. T. Gage, Curator of the Calcutta Herbarium, to whom I fear I have on many occasions given much trouble during the preparation and publication of the present volume.

I wish also to tender my warmest thanks to Sir Joseph Hooker, who has encouraged me to undertake the task of preparing a general work on the Asiatic Palms, and to Sir William Thiselton-Dyer, his successor in the Directorship of the Botanical Museum of Kew, which has been my main source of information regarding the Palms that form the subject of the present study. I have likewise to express my thanks to Professor A. Engler for the loan of the sets of *Calami* and *Daemonorops* of the Berlin Herbarium, carefully arranged for me by that enthusiastic Phoenicologist Dr. Udo Dammer. The Berlin collection has proved very rich in new species, chiefly the fruits of the explorations of Dr. Merrill in the Philippines, of the German botanists in New Guinea, and specially of Dr. Warburg in various parts of Malesia and the adjacent countries.

My cordial thanks are also due to Professor L. Radlkofer who has granted me the use of some of the type specimens of Martius, preserved in the Herbarium at Munich; to the late Professor Crepin and to Professor Durand for still other types of Martius that exist at Brussels; to the late Professor Suringar and to my lamented friend Dr. Boerlage of the Leiden Herbarium who selected, on my behalf and sent to Florence, an instructive specimen of every one of the species of Blume; to Dr. J. W. C. Goethart, who has more recently sent me valuable contributions from the same s'Rijks Herbarium of Leiden; to the late Professors Regel and Maximowicz, also lost friends; and to their successor Professor Fischer von Waldheim, for the loan of the entire collection of Palms belonging to the St. Petersburg Herbarium.

I have also to thank the following friends for their kindness in supplying me with specimens of Palms of which I was in need:—Mr. Casimir de Candolle of Geneva; Dr. John Briquet, Conservator of the Herbarium Delessert; Mr. G. Beauverd, Conservator of the Herbarium Barbey-Boissier; Dr. A. Zahlbruckner of the Vienna Herbarium; Professors E. Bureau, J. Poisson and E. Bonnet of the "Muséum d'Histoire Naturelle" of Paris.

To Mr. H. N. Ridley of the Botanic Garden of Singapore I am indebted for many of the Palms that grow in that island and in Johore, regions which he has thoroughly explored.

But for the largest contribution to my work I am under a deep obligation to the Rev. Father Scortechini, so untimely lost to Science, who most generously placed at my disposal the whole of his Malayan Palms, with his notes and drawings, although this group of plants was one of those he had intended to describe himself.

I have derived valuable help from a most splendid set of the *Calami* and *Daemonorops* cultivated in the Botanic Garden at Buitenzorg, beautifully represented by extraordinarily large and complete specimens. For this collection I am indebted to Dr. Melchior Treub, the eminent Director of that great establishment: to him and to his assistants I wish gratefully to express my warm thanks.

It gives me much pleasure also to acknowledge the kind help of many friends who have most generously supplied me with invaluable specimens from their collections. Thus I have to thank my late friend Baron Ferdinand von Mueller for many Australian and Papuan Palms; Mr. Louis Pierre, of whose monumental Forest Flora of Cochin China the botanical world greatly regrets the discontinuance, for many Indo-Chinese specimens; Sir D. Brandis, Mr. C. B. Clarke and Mr. J. Sykes Gamble, for Palms from various parts of India; my late dear friend Signor Leonardo Fea, for Palms from Central Burma; the late Dr. K. Schumann for some from New Guinea; Dr. Schweinfurth for the few species growing in the Niam-Niam country in Central Africa; Mr. Gustav Mann, formerly Conservator of Forests in Assam, for an almost complete collection of the Palms of the various districts of that Province; and Mr. E. H. Man, for an equally important collection from the Andamans and Nicobars, of whose Civil Commission he was for so many years a member.

In conclusion, it may be remarked that from the commencement of my own explorations I gave special attention to the collection of Palms. The material brought together by myself to represent these Princes of the Vegetable Kingdom is, therefore, as regards the tropical Asiatic Archipelagos, probably more important than that existing in any other Museum. This material is now the property of the "Istituto di Studi Superiori" of Florence; and I feel certain that the authorities who superintend it must be very pleased to see an important part of their collection now magnificently illustrated through the enlightened munificence of the Government of Bengal.

O. BECCARI,

FLORENCE, 1905.

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CALAMUS.

INTRODUCTORY ESSAY.

1. *Biological and General Notes.*

THE species included in the genus *Calamus* are usually slender elegant Palms which have, during the evolutionary period, acquired the power of raising their leafy crown above the heads of the loftiest trees in primeval tropical forests of the Old World.

We may suppose that originally the species of *Calamus* were delicate, standing Palms endowed with a very active and rapid growth, and of such a structure as to render the increase of their stem in length more easy than its increase in diameter. This peculiarity, coupled with their tendency to overgrow other plants in search of light and of conditions more suitable for the fertilization of their flowers may have been acquired, according to an hypothesis of my own,* during the period—very remote in the evolution of organised beings—which I have termed the "plasmatical era," by means of the hooked spines with which these palms are furnished, which endow them with the faculty of suspending themselves from neighbouring plants and even of rising above them.

A *Calamus* in order to change its erect habit into a climbing one had, according to this hypothesis, necessarily first to acquire the organs needed to ensure this essential condition of its existence. These organs are, with hardly an exception, common spines which have assumed a hooked shape.

The means whereby Palms have been enabled to acquire spines of this kind is one of those morphological problems which, like the metamorphosis of any other organ of living beings, we are unable to explain scientifically, but as to which we are obliged to remain satisfied with some more or less plausible hypothesis.

I suppose therefore that the spinosity of Palms, especially that which besets the leaf-sheaths, was originated by the stimulus induced in the very sensitive peripheral tissues by animals in search of nutriment in the youngest and most tender parts of the plant.†

I suppose therefore that the young central parts of every spinous Palm must have been coveted for nourishment by numerous animals, had they not been defended by spines. It is quite impossible for me to explain now, even superficially, how the stimulus produced by the action of certain animals on the irritable vegetable tissues may have given rise (in very remote times) to hereditary epidermal outgrowths or hyperplasia; organs of such a nature as we may consider the spines to be. Nor can I explain how it is possible that the stimulus which exercised its action at a definite point may have induced the production of spinous organs in almost every other part of the plant. As we have already seen, the spines which enable the *Calami* to climb are hooked, or are of the kind that, in the descriptions of the species, we have agreed to term "claws." These claws are almost exclusively met with on the axial parts of the spadices, on the leaf-sheath flagella (abortive spadices), on the leaf-rachis and, especially, on its prolongation or cirrus.

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* Beccari: Nelle Foreste di Borneo, p. 293.

† Beccari: Nelle Foreste di Borneo, p. 179.

According to the view now explained we can imagine that the hooked spines owe their origin to a special sensibility of the protoplasm, which at certain determinate points, where the reaction to the stimuli happened to be more effective, induced the tendency to stretch towards and twine round extraneous and heterogeneous bodies. The causes which have given origin to the hooked spines ought apparently to belong to the class of causes which have produced the numerous other contrivances whereby an erect plant acquires the power to climb. This statement is, to a certain extent, borne out by the fact that all Palms which have hooked spines on the leaf-rachis and on the spadices, or which have clawed cirri at the ends of the leaves, or have the leaf-sheath flagella similarly armed, are climbing species; whereas, when a Palm is only armed with straight spines it is certainly an erect one, or is bushy and short-stemmed, like *Mauritia*, *Eugeissonia*, *Sagus*, *Zalacca*, *Oncosperma*, etc. All scandent *Calami*, or to speak more generally, all climbing Asiatic Palms owe their fitness for this kind of existence to the transformation into "claws" of the short straight spines which defend certain parts of the plant; whereas species of the American genus *Desmoncus* and of the African genera *Eremospatha* and *Ancistrophyllum*, which also climb, are indebted for this property to the transformation into rigid and valid hooks of the smaller and apical leaflets of their fronds.*

Among the numerous species of *Calamus* known to me, only one, the small almost stemless *C. pygmaeus*, found on the tops of the mountains of Borneo, is able to raise itself a few feet from the ground through the surrounding shrubs by means of the small deflexed branchlets of its filiform spadices, which act as hooks.

As all *Calami* have, without doubt, originated in the densest tropical forests, and as the power of attaining the summits of the trees among which they have to struggle for air and light has been one of their most important needs, contrivances of various kinds and different nature have been evolved for the accomplishment of this purpose; consequently, the numerous modifications induced by this circumstance in their organs, supply most important characters whereby it is possible to distinguish the various species of the genus *Calamus*.

The spinosity, together with slight morphological modifications in certain organs, is the principal contrivance by which *Calami* climb. These modifications are:—

(1) the extension of the summit of the leaf-rachis into a cirrus:

(2) the extension of the main-axis of the appendix into a long filiform-clawed appendix:

(3) the transformation of the spadices into long whip-like clawed organs.

With the help of these characters it is not difficult to bring the greater part of the species of *Calamus* together into more or less natural groups.

The spathes also afford important characters that can be made use of in classifying the species of *Calamus*, though to a less degree than in the case of *Daemonorops*, a genus in which the chief function of the spathes is to protect the flowers, whereas in *Calamus* the spathes also often to a certain extent assist the plant to climb.

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[*] Owing to the peculiar arrangement which prevails in the Botanical Museum of Florence, where the library has been placed some kilometres away from the herbarium, I have not of late had any opportunity of consulting the paper, by F. O. Bower, on the modes of climbing in the genus *Calamus* (Annals of Botany, vol. I, p. 126).

The spinosity, length and scandent nature of the stem, and the unwieldy size of the leaves and spadices of many *Calami* are causes of much annoyance, labour and loss of time to the botanist who is obliged to collect specimens of such plants. On the other hand, this study has been greatly hindered by the very incomplete and fragmentary manner in which, on account of these difficulties in collecting them, the species as a rule are represented in herbaria.

Another not uncommon cause of error has been the differences that exist between the spadices of the two sexes, to say nothing of the association, which has frequently taken place in herbaria, of the leaves of one species with the spadices of another. Moreover, not a few species have been based on specimens belonging to only one sex, or on portions of but a single plant, and it has seldom happened that the description of a species has been based on the inspection of a good and large suite of specimens taken from many individuals. If indeed we had been content to describe only those species of which we possessed complete specimens, that is to say entire full-grown leaves, male and female spadix and fruit, the number of those secured to science would have been far smaller than it now is. Owing to the fragmentary nature of the material available for the study of these *Calami* it has been necessary to give a very rigorous, minute and full description of the various parts of the specimens actually at hand. These often have belonged to but one individual; consequently the descriptions now offered, like those of other authors, are not only in many instances lacking in completeness, but frequently fail to give all the characters essential to the collectivity of individuals that constitutes a species. They only indicate the peculiarities of a single member of such a collectivity, or to be more precise those of only a small portion of some of its organs. I am led to make this remark because in more than one instance it may happen that the specific characters which I have assigned to a species will prove inconstant, or, when larger and more complete specimens become available, even be found to be not altogether exact.

It is indeed impossible, when we have only one half or a fragment of a leaf available for study, to form a precise idea of the degree of variability or of the extent and amplitude of the characters of the leaves of a given species. When, for example, the statement is made that the leaf of a particular species has a petiole 10 cm. long, with three pairs of leaflets on each side of the rachis, it is not meant by this that in every leaf of the numerous individuals which constitute the species the petiole must always be of that length and the leaflets always be exactly of this number. The phytographer, when he has not sufficient material at his disposal, is of necessity compelled to describe the individual. On the other hand, the student who tries to recognize a species from a description made under such circumstances will be careful to give no more than their due importance to the characters assigned by the author and will make sufficient allowance for variability.

In the case of *Calami*, as in that of many other Palms of large size, the conditions are not as they are in the case of small plants whereof a considerable number of specimens from different places may be brought together for comparison in the herbarium, so that the student is enabled to acquire a complete knowledge of the degree of variability exhibited by the individuals which constitute a species. From what has been said as regards the very fragmentary condition of the material now available for the study of *Calami*, it will be realized that, very often, even the most essential characters of a species have been derived from small portions of a single plant, which have accordingly had to be described with great precision because we cannot predict which of those characters are constant and which are variable. The fragmentary state of herbarium specimens of *Calamus* is, moreover, often a great hindrance in the grouping of species according to their natural affinities, and this task has more than once to be accomplished by the author as the result of a mental reconstruction of the entire plant from the few fragments that are available to him for study.

The incompleteness of the specimens of *Calami*, the difference between the male and female spadices, or between the flowers and the fruit, and in particular the not infrequent fact that the spadices in herbaria are not from the same plant as the associated leaves, have led even the most experienced botanists to propose a few non-existent species: nor am I certain that the present work is entirely free from the same blemish.

II.—Spinosity.

The nature of the spinosity on the different organs of the *Calami* is of great diagnostic importance. We know of no quite spineless *Calamus* and even *C. Meyenianus*, which usually has unarmed leaf-sheaths and leaves, now and then bears a few prickles on the spadices.

In every case the spinosity of *Calamus* is due to an hypertrophic growth of the peripheral tissues of the plant. I know of only one exception to this rule, in *C. javensis* VAR. *acicularis* (PLATE 41), which bears on the petiolar part of the leaf a few spinescent organs analogous to the long hooks that occur on the prolongation of the leaf rachis in the African palms of the genera *Ancistrophyllum* and *Eremospatha* and in the American genus *Desmoncus*. The spinescent hooks which provide the Palms of the genera mentioned with the means of climbing are obviously quite different as regards origin from the hooked thorns of a *Calamus*, and are no more than transformed and abortive leaflets; of this nature also I take the spines at the base of the petiole of *C. javensis* VAR. *acicularis* to be.

The spines of *Calamus* are to be differentiated into those that serve for defence and those that help the plant to climb. Spines of the former category are long and straight, and it is to indicate these that in the descriptions of species I have restricted the proper name of "spines." They are essentially organs of defence, to be found especially on the leaf-sheaths, at the bases of the petioles, and sometimes also on the leaf-rachis and on the primary spathes. When these true straight spines are shorter and broad-based they are more particularly termed "prickles" Spines of very small size, or "spinules," are besides produced on the main nerves or "costæ" of the leaflets and on their margins; from these we pass gradually to rigid or criniform "hairs" and to "bristles."

The spines which subserve the function of fixing the plant to adjacent trees, and so enabling it to climb, are short with a broad base, and have a curved very sharp tip so that they resemble the hooked nails of a cat; these in the descriptive portion are especially termed "claws." There are, however, numerous transitions between the two principal sorts of spines. In the non-scandent species true claws are very scarce, very imperfect, or wholly absent.

Calamus Oxleyanus is the only species known to me which is provided with a long and powerfully clawed cirrus at the extremity of the leaf, but nevertheless appears to be a non-scandent Palm. With this solitary exception, which (see observations on *C. Oxleyanus*) is perhaps not absolute, the non-scandent species of *Calamus* are almost exclusively armed with straight spines. *C. erectus*, for example, is densely beset with long laminar spines on the leaf-sheaths, on the petiole and leaf-rachis and spathes, and only bears some small rudimentary claws on the tail-like appendix at the summit of the spadices.

The spines which defend the leaf-sheaths are usually laminar, flat, elastic, more or less elongated, very sharp, often smooth and shining, light-coloured, brown or almost black or of the colour of the surface of the sheaths, solitary or scattered, or more or less confluent by their bases and seriate, or even disposed in annular horizontal or oblique rings or whorls; the spines near the mouth of the sheaths are often longer and more slender than the others.

Frequently with the larger spines are intermingled smaller ones or even small wart-like pungent tubercles. In some species (*C. platyacanthus*, *C. ornatus*, *C. palustris*, etc.), the spines have a very broad base which is concave beneath and swollen above, where it is sharply separated by a definite line or narrow furrow from the laminar acuminate point. Sometimes in place of spines the sheaths bear brittle rigid criniform bristles, as in *C. Muellerii*, or small rigid hairs seated on a bulbous base, as in the species of the group of *C. ciliaris*; in these the hairs are usually deciduous with age or at a certain time separate from their bulbous permanent bases; these latter render scabrid the surface of the parts on which they are situated. In one variety of *C. tenuis* the bases of the spines are unusually extended laterally, while the points remain atrophied; and, as a few of these spines are aligned close together, their bases remain in contact right and left so as to form continuous, slightly raised, more or less oblique submembranous ridges across the sheaths. In *C. corrugatus* the surface of the sheaths is rendered uneven by the presence of merely annular raised wrinkles. Some spines when young have their margins fringed with a furfuraceous scurf.

Very rarely the spines of sheaths are curved or hooked, and I recollect only *C. javensis* VAR. *tenuissimus* as a form in which they have a tendency to become so. The spines on the petioles, especially those near their base or along their margins, as well as those that sometimes occur on the first or basilar spathe or on the rachis of certain leaves are usually less laminar, thicker and stronger than those of the leaf-sheaths.

Very peculiar are the spines of *C. tomentosus*, which consist of small black points rising from the centre of small mamillate swellings or tubercles. Very curious too are the spines of the leaf-sheaths of *C. radulosus* and *C. spathulatus*, which instead of being, as is usually the case with the spines of leaf-sheaths, horizontal or deflexed, are ascending, semiconic, short, thick, flat beneath and have a distinct axillary swelling at the base in their upper part.

Sometimes the spines are confluent and, by their united bases, form membranous crests which are crowned by permanent or deciduous needle-like spiculae.

Not infrequently the spines, especially when rather strong, leave on the surface of the sheaths or even on the underside of the leaf-rachis, a more or less distinct and deep impression of their outline; this is due to the fact that when the leaves are closely packed in the terminal shoot the spines are turned upwards, and are pressed against the surface of the organ from which they originate, while, after the expansion of the leaves, these spines become at first spreading and at length horizontal or deflexed.

Whenever the rachis is prolonged beyond the ultimate leaflets as a filiform or whip-like appendix, or when a similar appendage crowns the summit of the spadix, or when leaf-sheath flagella are present, the armature of these parts consists of hooked prickles or claws, while at the same time the lower surface of the leaf-rachis and the attenuated portions of the spadices interposed between two partial inflorescences are usually similarly armed.

The claws at times are slender but more frequently they are robust, with a broad and swollen base and a very sharp and short curved point. In the first or lower portion of the rachis they are usually solitary, but they became 2–3-nate and even digitately 5-nate upwards when the rachis is prolonged into a cirrus; in this case the claws usually form $\frac{1}{2}$-whorls at regular intervals. In very robust species they even form $\frac{3}{4}$-whorls, the claws being then 6–7 in number and confluent by their bases. It is, however, very rare, except at the extreme apex, for the circle of claws to be closed and form a complete whorl. The leaf-sheath flagella and prolongations of the spadices, when present, are similarly armed.

The different kinds of spines of *Calamus* are all, as already stated, outgrowths of the peripheral tissues and consist of their lengthened cells with tapering ends (*clostres*), which are very closely united and form externally a very resistent sheath of prosenchyma, while the interior is composed of a more or less abundant wall-like or muriform parenchyma. In the spines of *C. Flagellum* VAR. *karinensis* I have happened to find besides a few slender bundles of spiral vessels.

Every kind of spinosity, but in an especial manner that of *Calamus*, is assumed by me to owe its origin to certain stimulative causes acting on tissues liable to hypertrophic cellular growth. I suppose therefore that a bite, a sting, even simple contact, or any other agency capable of irritating the protoplasm, when in the full force of its vitality, may have produced, *during the plasmatical era*—that is to say, in the very early periods of the evolution of organisms, and under special circumstances—certain local hypertrophic excrescences. These, having in the course of time acquired the power of being transmitted to the progeny, may have been changed into spines.

In the category of spines, rather than in that of rudimentary leaf-blades, I would also include the scales of the loricated fruits of the *Lepidocaryeæ*.

III.—The Stem.

The stem of *Calamus* is usually slender and very long; for as *Calami* are Palms of very rapid growth, the annular thickenings or rings of the stem where the leaves are attached are very far apart and consequently the internods are very long and sheathed by the basal tubular part of the leaves.

In a very few species the stem is erect; in this case it never attains a great height. In *C. arborescens*, which is I believe the largest known erect species, the stem reaches a height of 5–6 metres, and, when divested of its leaves, a diameter of, at most, 6 cm. The stem of *C. bacularis*, another non-climbing species, is about the size of a common walking cane.

The species of *Calamus*, which possess erect stems, appear to be of less rapid growth than the climbing ones, as their joints are rather short. I know only one species which is almost stemless; this is *C. pygmaeus* the small Bornean Palm already alluded to, certainly the most diminutive species of the whole genus. *C. Lobbianus* appears also to be an almost stemless plant. *C. tonkinensis* and *C. salicifolius* are bushy species with rather short slender recumbent stems. *C. acanthospathus* appears to be at first erect, but ultimately subscandent, never however attaining a great length. The stem, in climbing species, with the sheaths on, varies from 4–5 mm. in diameter in some varieties of *C. javensis* and in *C. filiformis*, to 10 cm. in *C. andamanicus;* when divested of the sheaths, the range is from 2–3 mm. up to 4 cm. The length of the internodes is usually great and attains the extraordinary length of 90 cm. in *C. Scipionum.*

The total length of the stems of *Calami* has been greatly exaggerated. Roxburgh (Flora Indica, Vol. III, page 777) assigns to his *C. extensus* a length of from two to three hundred yards, but I think that even if feet instead of yards be meant, this length is still excessive. Loureiro, too, gives to his *C. rudentum* the extremely unlikely length of 500 feet. With regard to this subject I have to say that I never measured a *Calamus* at all approaching these dimensions, and that all those observed by me were certainly under 50 metres (about 150 feet). As *Calami* are climbing plants, the entire length of their stems may be approximately estimated by the height of the trees which support them; often, however, the lower part of their stems is procumbent creeping long distances on the soil of the forest, so that a *Calamus* plant may be considerably longer than the height of the tree from which it is suspended. This is brought about by the fact that the leafy crown of a palm of this kind is, on account of its being too slender, unable to maintain itself freely above the aërial plane of the forest and as new leaves and spadices or flagella are successively produced, those which preceded them and are situated lower down the stem gradually decay or lose their hold and do not succeed in retaining the plant in position by their hooked spines. Thus it happens that while the top of the palm strives to rise above and even to spread its fronds over the crowns of the loftiest trees, it has on account of its weight a contrary tendency to find a lower level. As the result of these two opposing agencies, the crown of the plant remains constantly at about the same aërial level, while the lower portion of the naked stem creeps for a considerable distance on the ground below.

The internodes of the stems of the *Calami* are sometimes exactly cylindric, but not infrequently are slightly enlarged upwards; those of the higher or adult part of the plant usually have a slightly raised longitudinal swelling or ridge on the side of the insertion of the spadices. As the spadices are inserted on the leaf-sheaths, and as the leaves, though really spirally disposed, are apparently opposite, one internode has the ridge on one side, the next has it on the side opposite. This ridge marks the course of the fibro-vascular bundles which pass into the spadix or into its homologue the leaf-sheath flagellum. The fibro-vascular bundles of one internode of the stem pass into the sheath next above, which they traverse throughout its length; their course is marked by a slight longitudinal swelling of the surface on the side which corresponds with the analogous swelling on the internode; this ridge usually ends near the mouth of the sheath where the spadix is inserted.

The stems of *Calami* are usually rather spongy in the centre, and are always very hard externally, though they are at the same time flexible and elastic. The stems of *Calami* divested of their sheaths have almost always a polished surface, and look as if covered with a thin layer of vitreous varnish; sometimes, however, the surface is opaque, but almost always is of a straw-yellow colour, especially when dry. This vitreous appearance of the naked canes of many *Calami* is due to the presence of a very thin layer of a silicious substance which entirely covers them.

When the stem of a *Calamus*, more particularly of one that has a very polished and shining surface, is bent, small thin lamellæ may be seen to crack off as the result of the fracture of the thin coating of silicious material with which the cuticle of the stem is laden. In these lamellæ no cellular structure whatever can be made out. The cells which constitute the epidermal layer of the stem, and immediately underlie this cuticle, are also more or less laden with silica, frequently to such an extent that even after incineration they retain their form and preserve their minutest details, so that even the characteristic structure of the stomatic cells continues unaltered. The histological elements of the inner part of the stem are, however, only very partially silicised.

This abundant silicious secretion in the tissues of Palms suggests to my mind the hypothesis that the frequency with which the wood of Palms is found silicised in a fossil state may not depend entirely on a molecular substitution of silica for cellulose in the wall of their cells, but may also be due to the excessive impregnation of that substance which probably already existed during life in the tissues of the Palms of past ages.

The more polished and vitreous the surface of a stem is, the more it is impregnated with silica and the more it is valued for economic purposes. In the category of species whose stems are thus valuable are included *C. cæsius*, *C. optimus*, *C. tenuis*, *C. Rotang*, etc.

IV.—The Leaves.

The leaves or fronds of scandent *Calami* often appear at first sight alternate, owing to their being separated from each other by considerable intervals because of the elongated character of the internodes. When, however, the leaves are closer together, as is the case near the apex of the stem where they form a more or less dense crown, a spiral tristichous arrangement is quite obvious.

A complete *Calamus* leaf is made up of a basilar portion or sheath, which usually takes the form of a tube completely enclosing each joint or internode, and of the leaf proper. Within the latter we have to distinguish a medium portion or rib known as the rachis, and to right and left of the rachis the leaflets, which vary in number according to the species. The first or lower portion of the rachis which usually is destitute of leaflets may be held to represent the petiole. Then in whole groups of species the rachis is prolonged beyond the distal leaflets as a long and slender whip-like clawed appendage termed the cirrus.

The leaves of an adult *Calamus* plant are always pinnate except in the cases of *C. flabellatus*, where they are furcate-flabellate, in that of *C. radiatus* where they are digitate-radiate and in those of *C. digitatus* and *C. pachystemonus* where we find only 2—4 leaflets approximated at the apex of the petiole. These three kinds of leaves, however, are, it is to be noted, kinds that first appear after the germination of the seed, even in those species that ultimately have regularly pinnate leaves in the higher part of the plant.

On account of the diversity of form assumed by the leaves in *Calamus* it is therefore most important to know when describing them whether they be leaves from the lower or leaves from the upper part of the plant, because the differences between leaves from these two situations are often very remarkable. I have therefore in these descriptions of *Calami*, unless it is otherwise stated, always recorded the characters of the leaves of the adult plant.

In the measurements given by me of the leaves of *Calamus* it is to be noted that I include in the leaf that portion of the rachis which has no leaflets and which is usually spoken of as the petiole. But the sheath is not included nor is the terminal cirrus, when a cirrus is present; so that the length of the leaves is measured along the rachis from its junction with the sheath to the point of attachment of the uppermost leaflets.

As the first leaves in a very young plant of *Calamus* are flabellate, furcate, radiate or digitate, we may conclude that the pinnate leaves of the full grown plant are derivates of these simpler forms and consider *C. digitatus*, *C. pachystemonus*, *C. radiatus* and *C. flabellatus* as survivals of the primitive types of the genus.

The cirrus is often very long and is always armed with "claws." These claws, as we have already seen in discussing them generally, are sometimes solitary, but are more frequently 3-nate or 5-nate-digitate, especially towards the tip of the cirrus and in more robust cirri are even 7-nate and arranged in $\frac{1}{2}$—$\frac{3}{4}$ whorls with more or less uniform naked intervals between the groups of claws. In appearance and in function the cirrus corresponds exactly to the leaf-sheath flagellum, to be discussed further on: in origin, however, it is altogether different.

In cirriferous leaves the leaflets attached along both sides of the rachis may either cease abruptly at a definite point or may gradually decrease in size upwards.

The leaves of the lower part of the stem and the radical leaves are non-cirriferous, and often end in two more or less confluent leaflets or in bifurcate leaflets even in species where the leaves in the higher part of the plant normally have a typical cirrus.

In a few species, such as *C. ornatus* and *C. conirostris* the leaflets gradually diminish in size towards, and become abortive at the apex of the leaf, while the rachis becomes more "clawed" there than it is lower down, without, however, the development of a terminal portion devoid of leaflets.

If in the higher part of the stem of an adult *Calamus* the leaves are destitute of a cirrus, then it is certain that the species is never cirriferous except as an abnormality, such as I have observed in *C. heteroideus*, in its VAR. *pallens*, and in *C. exilis*, where occasionally a very slender cirrus appears at the apex of their otherwise constantly paripinnate leaves.

Whole groups of species are characterised by the absence of cirri from their leaves, and it never happens that a species with non-cirriferous leaves in the upper part of its stem is cirriferous lower down: the opposite condition is, however, of common occurrence. For example, in a terminal portion of *C. asperrimus*, one metre in length, with five fully expanded leaves, the lowest of these leaves ended in two leaflets with no rudiment of a cirrus between them, the next above had a scarcely aculeolate cirrus 7 cm. in length, while the sixth had the cirrus 55 cm. long and densely armed with 3-nate claws. In the intermediate leaves the cirrus exhibited a gradual transition between these two extremes.

When there is no cirrus the leaves end in two equal or sub-equal leaflets which are usually the smallest on the whole leaf, and may be perfectly free at the base or may be, to a greater or less extent, connate. Sometimes a very short rudimentary cirrus appears normally between the two terminal leaflets, as in *C. Blumei* and *C. rhomboideus*; still more rarely the leaf terminates in a small solitary undivided leaflet as in *C. ramosissimus*.

In most *Calami* the leaves are pinnate and the leaflets very regularly disposed on both sides of the rachis, but in this case I have frequently observed all the leaflets on one side slightly smaller than the corresponding leaflets of the opposite side, and at times even more remotely inserted on the rachis. Very frequently the leaflets are inequidistant, geminate or attached in couples, as in *C. latifolius*, or aggregated in three, four, or even larger numbers along the rachis, as in *C. gracilis*, *C. fasciculatus*, etc.

In *Calami* the leaflets are always symmetric at the base except in *C. Blumei* and to a less degree in *C. tomentosus*; they never are sigmoid or falcate.

In shape the leaflets vary a good deal. Most frequently they are broadly linear, more or less ensiform, or narrowly lanceolate and acuminate, where the proportion of breadth to length varies from 1 : 10 to 1 : 20. There is, however, no lack of other forms, such as lanceolate, oblanceolate, ovate, obovate, elliptic, oblong, spathulate, etc. When the leaflets are comparatively broad they are often convex on one side and concave on the other, or are spoon-shaped, specially towards their apices: in a small group, that to which *C. rhomboideus* belongs, they are more or less lozenge shaped.

The leaflets almost always terminate in a symmetric, more or less acuminate and bristly-brushed tip; very often, however, we may observe here a small notch or indentation on the lower margin not very far from the apex; this notch in many cases is inconspicuous or even obliterated, while in others it is rather conspicuous as in *C. australis*, *C. pseudo-tenuis* and especially in *C. Lobbianus.* I suppose that this notch may possibly be the last trace of the derivation of an acuminate leaflet from a truncate one. Among *Calami* leaflets with a truncate transversely cut or premorse end, analogous to those of a typical *Ptychosperma,* are only found in *C. caryotoides.*

The leaflets in *Calami,* without a single exception, are attached to the rachis by a very narrow point, tapering always more or less gradually or even abruptly towards the base where the lamina, commonly doubled downwards, forms just at the junction with the rachis a small cavity on the lower surface, within which in many cases nestles a small swelling which resembles an extra-nuptial nectary. In *Calamus* the leaflets are never decurrent along the rachis.

Very important characters are derived from the main nerves or "costæ" of the leaflets, as their varying distribution appears to correspond to a varying grouping of the fibro-vascular bundles in the axial parts of the plant.

Most of the *Calami* have narrow leaflets with one or three primary nerves or costæ, running throughout their entire length, sharply prominent on the upper surface and usually less distinct on the lower. In not a few species there are five main or primary nerves, less often seven to nine, and even, in *C. rhomboideus,* twelve; but, whatever the number of the costæ may be, the central or midrib is almost always the strongest. All the primary nerves in the leaflets of *Calamus* traverse the entire length of the blade and meet at its apex, except in the species of the *C. rhomboideus* group, where the nerves nearer to the margins usually disappear at different levels and do not reach the apex.

Between the primary nerves we find interposed others more numerous and more slender; very frequently one of these secondary nerves runs along or very near the lower margin so as usually to slightly thicken it; in the leaflets of *Calamus* a primary nerve is never found running along the margin.

When the leaflets are rather broad, as is the case in *C. palustris*, *C. latifolius*, *C. javensis*, etc., their lower margin is often bordered on the upper surface by a polished shining band a few millimetres wide; sometimes a few more similar bands are found also in different places along the lamina; these lines correspond with the portions of the leaflet that are outermost in the leaf-bud. As the leaflets before the leaves expand are longitudinally plicate and closely packed together, these polished bands look as if they had been produced by friction as they were being forced out from the central terminal shoot.

The primary and secondary nerves are connected by means of transverse veinlets which are more or less interrupted and anastomosed. In some species this secondary venation forms a very elegant network and is very conspicuous, the component veinlets being close together, slightly sinuous, thin but very well defined and continuous, that is to say crossing transversely the whole width of the lamina; good instances of this style of venation are seen in *C. insignis*, *C. heteracanthus*, etc. Usually these transverse veinlets are more distinct on the upper than on the lower surface.

Very commonly we find the central costa and some of the lateral primary nerves more or less beset, now on the upper, now on the lower surface and now on both with hairs, bristles or spinules; the presence or absence or varied situation of these supply easy though not always reliable differential characters. In *C. ciliaris* and in other species of the same group the secondary and tertiary nerves are also covered with hairs, and if these nerves be numerous and very close together, the surface has the appearance of being uniformly hairy, as for example in *C. hispidulus*.

In a very few species a solitary spine is found, though not constantly, on the upper surface of the central costa near the base of the leaflet (*C. tenuis* and *C. Rotang*). In *C. spinifolius* the leaflets are armed with 3–5 erect and comparatively strong true spines. The leaflets of *C. salicifolius* are also more or less supplied with a few spines of this character; these, however, are absent from its VAR. *leiophyllus*.

In texture the leaflets of *Calamus* are usually thinish, sometimes sub-herbaceous or membranous, often chartaceous, and occasionally thinly coriaceous; very frequently both surfaces are of the same green colour, but the upper surface is most usually shining while the lower is dull. In comparatively few species the lower surface is more or less conspicuously different in colour, being mealy-pulverulent and subpurpurescent in *C. Griffithii*, glaucescent in *C. cæsius*, mealy-ochraceous in *C. symphysipus*, mealy-white in *C. arborescens* and *C. hypoleucus*, or decidedly white and as if coated with a thin chalky layer in *C. Lobbianus*, *C. leucotes* and *C. discolor*. Only in *C. deerratus* have I observed the lower surface sprinkled with small punctiform scales.

The margins of the leaflets of *Calami* are very seldom absolutely smooth; most commonly they are furnished with cilia or very small adpressed or spreading spinules.

The leaves of *Calami* usually retain their light green colour in dried specimens, but certain species, especially those of the *C. andamanicus* and of the *C. platyspathus* groups, assume in drying a light brown or tobacco colour, while *C. spathulatus*, *C. Martianus*, *C. insignis* and a few others are readily recognisable in herbarium specimens by their bright yellow hue.

V.—The Leaf-Sheaths.

The leaf-sheaths of the leaves of *Calamus* are very important organs of the plant. In most *Calami*, in all those species we may say that are scandent, a leaf-sheath arises from each ring of the stem and forms a complete more or less elongated cylindric tube round the internode immediately above. In the non-scandent species the leaf-sheaths are more or less open along the ventral aspect.

The leaf-sheaths are always of a firm, tough or more or less coriaceous texture, and are sometimes even woody; but their leading characteristic is that they are always more or less covered with spines, which assume a great variety of forms and furnish one of the most conspicuous and useful diagnostic characters for the discrimination of many species.

It would seem that during the period characterised by great morphological malleability of organisms the tendency to variation was very active in the direction of acquiring a high degree of spinosity, as being that which secured for the plants its most valuable means of defence. But while differences in the character of the spinosity, of what we may call the "armature" of the leaf-sheaths, afford one of the best characters in distinguishing the species of *Calamus*, it sometimes happens that two plants, one with powerfully armed the other with smooth leaf-sheaths, cannot be considered specifically distinct; thus *C. ornatus* VAR. *horridus* is formidably beset with very large spines, while its VAR. *mitis* is almost smooth.

The tubular cylindric leaf-sheaths have commonly a kind of pouch in their dorsal upper portion at the base of the petiole, so that they may be termed gibbous; the leaf-sheaths of the non-scandent species which are open on the ventral side are without this peculiarity and are gradually narrowed into the petiole.

Leaving the spines out of account the surface of the leaf-sheath is at times glabrous, pulverulent, greenish, glaucous, or more or less clothed with a deciduous or easily removeable furfuraceous whitish-grey, or brown skin of fluffy indumentum. I know only *C. tomentosus* where the sheaths, in common with other parts of the plant, are entirely clothed with a permanent white tomentum.

The leaf-sheaths are often longitudinally striate or indented with the impressions stamped upon them by their own spines.

In a few species, such as *C. latifolius*, *C. marmoratus*, *C. Feanus*, *C. javensis*, the sheaths in the younger parts of the plant are variegated, spotted or marbled with whitish, dark-green or purplish patches.

The fact that the most important fibro-vascular bundles, such as those that enter the reproductive organs, pass from the stem through the nodes into the sheaths indicates the complex, almost sympodial character of this part of the leaf. The vascular bundles usually traverse the entire length of the sheaths, and their surface is generally marked externally, as has already been seen, by a more or less longitudinally raised ridge which terminates at the insertion of a spadix, or of a leaf-sheath flagellum, laterally near the mouth of the leaf-sheath itself.

Owing to this peculiarity of structure the spadices, like the flagella, emerge from near the apex of the sheaths and never arise in the axils of the fronds; only in *C. axillaris*, where the leaf-sheaths are comparatively short and where one sheath covers a considerable portion of that immediately above, do the spadices, which moreover are inserted far below the mouth of the sheaths, appear axillary. Even when the sheaths are not exactly tubular but are more or less open on the ventral side, as in *C. erectus*, so that they closely resemble the sheathing base of the fronds of those Palms that have axillary spadices, the spadices of *Calamus* retain their usual position and emerge laterally from near the apex of their proper sheaths; so that it appears as if the sheath at first formed a closed tube but was split longitudinally afterwards and the gap kept open by the growing central shoot.

The sheaths in those species with non-cirriferous leaves, and usually provided with flagella in the upper part of the plant, are without these appendages in the lower portion, as it seems that the flagella appear only when the plant has acquired a certain degree of development, the spadices being produced still later. In many cases in a full grown plant one leaf sheath bears a spadix and the next one a flagellum and so on: in other instances, such as *C. radiatus*, *C. pachystemonus* and *C. digitatus*, every sheath of a fertile and full-grown plant has its own spadix.

VI.—The Leaf-Sheath Flagella.

The leaf-sheath flagella are sterile or abortive spadices arising from some of the leaf-sheaths at the point where normally fertile spadices are inserted. We have conclusive proof that the flagella are no more than incompletely developed spadices in the fact that we occasionally find them bearing more or less incompletely developed spikelets, as not infrequently happens in *C. heteroideus*. Martius uses the name "lora" for the flagella, but I have chosen the latter term as being in more common use and more readily intelligible.

In very many species the spadix, and especially the female one, is prolonged at its apex into a long slender clawed appendix corresponding exactly to the apical part of a flagellum, but we must be careful not to mistake this appendix for a "cirrus" which is the corresponding flagelliform prolongation of the leaf rachis. For notwithstanding the very great similarity of the two kinds of appendages, especially in the matter of their function and the identity of their armature of claws, the flagellum has a morphological origin which is quite distinct from that of the cirrus.

The leaf-sheath flagella of some of the larger species are exceedingly strong and resistent and are sometimes of very great length; I have measured one in *C. flagellum* which was over 7 metres long. The biological function of the flagella is that of attaching the individual to neighbouring plants by means of the hooked prickles with which they are armed; consequently every *Calamus* provided with well-developed flagella is undoubtedly scandent. Those *Calami* that possess flagella are destitute of cirri at the ends of their leaves; and, on the other hand, those species with cirriferous leaves have no flagella, and their spadices are usually comparatively short, panicled and non-flagelliferous at their apices.

As a rule then cirri and flagella, being quite similarly armed with claws, are substitute-organs which take the place of each other in the function of providing the plant with means of climbing, but in some species of Group XII, the sheaths have flagella, the spadices are flagelliferous, and even the leaves are, though usually very imperfectly, cirriferous; these species seem therefore to have exerted every means in their power, and that to the utmost extent, to attain a climbing habit.

The flagella, being morphologically identical with spadices and only differing in the absence of branches and spikelets, consist of an axial portion clothed with cylindric closely sheathing spathes and, as in the fertile spadices, have the lowest or outermost spathe larger and firmer in texture than the subsequent ones, and actually armed with straight spines.

When a *Calamus* is not decidedly scandent, but is a derivate of species which climb and therefore possess well-formed flagella, we find that rudimentary flagella are present.

Flagella are quite absent from species with an erect stem, such as *C. erectus*, *C. arborescens*, etc. In the flagelliform species flagella are also usually absent in the earlier stages of the plant and only make their appearance when the plant has reached a certain height and begins to produce spadices. In many species, however, it is found that spadices alternate with flagella.

In those species where the leaves are cirriferous and the spadices are short and panicled, we observe now and then a rudimentary flagellum; in *C. latifolius*, for example, I have had occasion to note the presence of rudimentary flagella, 8–10 cm. in length, filiform, sheathed by quite tubular prickly spathes, while in other cases the place usually occupied by a spadix is indicated by a small protuberance. Such rudimentary flagella have remained abortive because it was not natural for the spadix which they represent morphologically to become flagelliform.

Very probably in the non-flagelliferous *Calami* the young plants may bear such abortive flagella; this I have had an opportunity of noting in *C. erioacanthus*.

Whether a species be flagelliferous or not may be ascertained from herbarium specimens even if the flagella are actually missing, because if the spadix is elongated and ends in a well-developed clawed flagelliform appendix, some of the leafsheaths are almost certainly flagelliferous; on the other hand, if the spadices be short, compact, panicled and not flagelliferous, most probably the sheaths are not flagelliferous and the leaves of the higher part of the plant are cirriferous.

VII.—The Ocrea.

The ocrea of *Calami* is a tubular stipule, occasionally split into two parts, bordering the mouth of the leaf-sheaths. In many cases the ocrea is much elongated and conspicuous, membranous or chartaceous in texture, glabrous or more or less clothed with hispid hairs or spicules, sometimes even more or less spinous; not infrequently it is very short or is reduced to a short ligule in the axil of the petiole.

Sometimes the ocrea is persistent and clothes the base of the sheath immediately above its own; its chief function seems to be the protection of the younger parts of the terminal shoot. Most frequently after the expansion of the leaves the ocrea decays and is lacerated or reduced to fragments or filaments, scarcely retaining any trace of its shape; sometimes, being deciduous or of a transitory nature, its former presence is revealed only by a narrow scarious rim at the mouth of the sheath.

In the African *Calami* the ocrea is usually rather elongate and tightly clothes the base of the sheath above its own, but its outer side is more elongated or produced than that facing the petiole; in these species, therefore, the ocrea assumes commonly the shape of the mouth of a beaked flute, and we may term it "reversed liguliform."

In *C. erectus* the ocrea is exceptionally large; it is tubular and entire while still enclosed in the terminal unexpanded shoot, but afterwards it is split along the ventral side into two halves, one on each side of the petiole, resembling two large auricles which are as much as 7 cm. in length, chartaceous and densely clad with hispid hairs.

A small group of species from New Guinea have a still more striking form of ocrea resembling that of some species of *Korthalsia;* in fact the ocrea of *C. macrochlamys* and *C. ralumensis* attain the extraordinary length of 30–35 cm. and are firm and thin in texture or chartaceous, elongate-conical or almost the shape of asses' ears, in other cases the ocrea is at first membranous and tightly embraces the sheath above its own and ultimately becomes disintegrated into filaments or fibres.

I do not know any *Calamus* in which the ocrea is transferred into a receptacle for harbouring ants, as is the case in some species of *Korthalsia.*

VIII.—The Petiole.

As we have already seen, the basal portion of the rachis of the leaf which does not bear leaflets is treated as the petiole. In *Calamus* therefore the petiole begins at the mouth of the sheath and terminates at the point of attachment of the first leaflets. The petiole is usually rounded or convex beneath and flat or channelled above; it is frequently armed with prickles, usually longer along the margins than elsewhere. The petiole of the radical leaves and of the young plants is generally a good deal longer and more cylindric than that of the adult plant, and in these the petiole of the upper leaves is shorter than that of the lower ones.

IX.—The Rachis.

The rachis represents the backbone or axis of the leaves in *Calami* just as in other Palms, and bears, right and left, a number of leaflets varying according to the species. In the description of the species the term rachis is applied only to that part of the axis of the leaves which bears leaflets, it having been decided to term the basal naked portion of the leaf-axis the petiole and the prolongation of the axis beyond the distal leaflets, when this occurs, the cirrus.

The rachis is not uniform throughout its length; being a continuation of the petiole it is more or less convex beneath towards the base and flattish towards the apex, where in all scandent species it is more or less armed with hooked prickles or claws; these are usually solitary lower down and become binate and then ternate towards the apex, and at last in some cases among the cirriferous species even quinate and half-whorled and of increased size and strength where the rachis begins to assume the essential features of a cirrus.

On the upper surface immediately above the petiole, the rachis is usually very slightly channelled or almost flat, and shows on each side of the central part a longitudinal furrow within which the leaflets are inserted; higher up the two furrows gradually vanish, the central part becomes narrower and is transformed into a salient angle with two converging sides or facets. There, consequently, the rachis is triangular in section, bi-facetted with a salient angle above and flattish beneath. This shape is almost invariably assumed by the rachis from the middle onward to the apex.

X.—*The Cirri.*

In speaking of the different kinds of spines and of the leaves I have already described the appendage of the leaf-rachis termed the cirrus, and have now very little to add. To recapitulate what has already been said; the cirrus is always more or less armed with solitary digitate, aggregate or more or less incompletely and dimidiately-whorled claws. Every *Calamus* possessing cirriferous leaves is scandent with, as we have seen, the exception perhaps of *C. Oxleyanus*.

When a *Calamus* has hooked prickles or claws on the leaf-rachis, on the primary spathes and the axial parts of the spadix, the plant is nevertheless scandent even if there be no cirrus at the end of the leaf, since the clawed leaf-rachis, together with the leaf-sheath flagella with which in this case the plant is provided, take the place of the cirri and perform the functions of climbing organs. On the other hand, when the hooked prickles characteristic of cirri and flagelli are absent from all its organs the species is most certainly bushy or has an erect stem.

To avoid confusion I have employed the term "cirrus" for the prolongation of the leaf-rachis, and have restricted the term "flagellum" to the appendage resulting from a metamorphosis of the spadix.

XI.—*The Spadices.*

As a general rule the species of *Calamus* are dioecious. The spadices spring always from the leaf-sheath and most commonly from its mouth laterally to the petiole.

The leaf-sheath in *Calamus* being almost always considerably elongated and the leaves being far apart from each other, the point of insertion of the spadices is exposed and visible, and it is only in species with a short erect stem and with the leaves grouped at its apex that the spadices at times simulate an axillary insertion. *C. axillaris* and *C. adspersus* among the climbing species are the only ones known to me where the spadices seem at first sight axillary.

As in most Palms the spadices emerge from the axils of leaves or from rings of the stem where once a leaf was situated, it ought to be worth while investigating by what morphological modifications and through what intermediate conditions the species of *Calamus* have arrived at a point of origin for their spadices so unlike that of other Palms and so unusual.

The point of insertion of the spadices, as of the flagella, on the leaf-sheaths is frequently marked by a distinct swelling or callosity, and, as we have already seen in discussing the leaf-sheaths, a slightly raised ridge, which marks the course of the fibro-vascular bundles that pass from the stem into the spadices, often also runs downward along the whole length of the sheath.

The axial part of the spadices of *Calami*, usually much elongated and very slender, is armed towards its slender filiform extremity with claws like those of a flagellum; besides therefore fulfilling its main function of bearing flowering branches, it is very often made use of as a subsidiary climbing organ. This is just the reverse of what obtains among the species of *Daemonorops*, where the spadices are always devoid of hooked spines and never are utilized as organs of climbing.

The spadices of *Calamus* belong to two principal categories. In the majority of the species they are much elongated or flagelliform, like those just referred to.

Spadices of this kind are more or less armed with claws, have the branches on which the spikelets are borne remote from each other, and have the axial portion interposed between two such branches more or less armed with claws on the outer side. Spadices of this class most usually occur in species that have non-cirriferous leaves and flagelliferous sheaths.

The second kind of spadix is peculiar to those species that have cirriferous leaves, but have leaf-sheaths which are not flagelliferous. In these species the spadices are comparatively short and broad, usually shorter than the leaves, panicled and often pyramidal with numerous approximated and gradually diminishing branches and with a rigid axis, non-flagelliferous at its apex. *C. palustris* and the other species of the group to which this belongs possess spadices of this character.

Only very few species have short and contracted spadices: *C. Lobbianus*, *C. conirostris*, *C. brachystachys* are instances. *C. simplex* alone has an undivided spadix with a simple spikelet at each primary spathe.

It may be laid down as a general rule that when a *Calamus* has a long flagelliform spadix the leaves are not cirriferous, and in this case if the leaf-sheaths do not bear spadices, these are replaced by long clawed flagella. On the other hand, when the leaves are cirriferous the leaf-sheaths are without flagella and the spadices are panicled and comparatively short.

In *Calamus* the spadices are always furnished with a variable number of cylindric or very rarely laminar spathes, to be explained presently at greater length; to each spathe there is a corresponding branch or "partial inflorescence."

As a rule in the species where the spadices are flagelliform there is no very great dissimilarity between the male and the female spadix, though in almost every case the female is less branched than the male one.

In the female spadix a simple branch-bearing spikelet springs from each spathe, and thus gives us a "simply branched" spadix; in the male spadix the primary branches are divided again and again, so that we have a "supra-decompound" spadix.

In a few species the male spadices, like the female ones, are simply decompound, as in *C. longisetus*, *C. leptospadix*, etc. Less often, the female spadix is also more or less partially ultra-decompound; this I have observed in the case of *C. luridus* and *C. tonkinensis*, where however only the basal portions of the lower partial inflorescences are branched again. Moreover, in *C. luridus* I have occasionally found sub-monœcious spadices in the form of inflorescences producing female spikelets in their lower parts and male ones at their apices.

A case of monœcism is also afforded by *C. rudentum*, where occasionally in the female spadix near its aper a few spikelets may be composed solely of male flowers; these are apparently fertile, but are more slender than the flowers on exclusively male spadices. I do not, however, know any truly monœcious *Calamus* with female flowers *normally* accompanied by fertile male ones on the same spadix, or with distinct male and female spadices on the same plant, though Roxburgh employed the specific name *monoicus* for the *Calamus* already characterised by Linnaeus as *C. Rotang*, which certainly is not endowed with the peculiarity. By a superficial observer every *Calamus* might be supposed to be monœcious, since in the female spadices every female flower is accompanied by another which, though sterile, frequently has all the appearance of being a male. Every *Calamus* has the true fertile male flowers brought together on a separate plant, and only very exceptionally some male spikelets may be found on a female spadix; all *Calami* are therefore essentially diœcious and every plant produces only spadices of one sex.

I have never chanced to find on the male spadix any trace of female flowers.

The appendages, more or less obviously of foliar nature, which clothe the axial parts of the spadices, are called "spathes." Those spathes that are inserted on the main axis and are visible even before the partial inflorescences emerge from them are the "primary spathes." The spathes of the inflorescence are termed "secondary" or "tertiary" according to the degree of division of the axial part on which they are inserted.

XII.—The Spathes.

Most commonly the spathes of *Calami* are tubular, do not completely envelope the flowers, and form superposed tubular sheaths to the axial part of the spadix. When the spadix is very young the primary spathes are enclosed one within the other, and gradually diminish in size from its base to its apex.

In a few species of the group to which *C. platyspathus* belongs, the primary spathes approach those of a *Daemonorops*, being at first tubular and completely enclosing the partial inflorescences with their flowers, but at flowering time bursting longitudinally so as to expand their limb into an elongated flat laminar blade with only a small tubular portion at its base; the partial inflorescences are then at liberty to expand their flower—bearing branches. Spathes of this kind somewhat resemble those of *Daemonorops longispathus* with this difference that those of the *Calamus* just mentioned give greater evidence of their origin from a tubular pattern.

The most aberrant primary spathes among *Calami* are those of *C. hypoleucus*, which are cymbiform and resemble those of a *Daemonorops* of the section *Cymbospatha*. All spathes of typical *Calami* of the flagelliferous groups are much elongated, while those species that have broad and short panicled spadices have shorter spathes: in both cases, however, they are always tubular and most commonly strictly and closely sheathing; less frequently the primary spathes, though tubular, are loose, enlarged in their upper part or earshaped. The primary and to a less marked degree the secondary spathes are of a rather firm structure, more or less thinly coriaceous or even almost woody; very commonly entire and truncate at the mouth and prolonged at the apex into a short limb; not infrequently their upper portion becomes decayed or, as in *C. erectus*, even lacerated and reduced to filaments.

The mouth of the spathes is often provided with cilia, elongated scales or paleolæ which are of a more or less fugacious character.

The length of the primary spathes usually corresponds to the distance intervening between two partial inflorescences; similarly the length of the secondary spathes corresponds to the distance intervening between the insertion of the spikelets in the simply decompound spadices or of the secondary branches in those that are ultra decompound.

The more distinctly flagelliform the spadices are, the more elongated is the portion of their axis interposed between two partial inflorescences, and in this case the base of the spathe is so gradually connected with the axis as to render it impossible to determine from the outside where the spathe begins to be an organ independent of the axis. When the segments of the axis interposed between two partial inflorescences are very long these are always, at least in their lower parts armed externally, like a flagellum, with simple ternate or even half-whorled claws.

As a general rule the spathes are more densely armed with hooked prickles on the outer or dorsal than on the inner or ventral side.

The lowest or outermost primary spathe is almost always somewhat differently shaped from those that succeed it, and provides important diagnostic characters. It is usually thicker in texture and less cylindric than the others; is not infrequently flattened and two edged and is more spinous on the margins and on the back than the upper spathes. In the very earliest stages of the spadix the first spathe includes all the subsequent ones; these emerge one from the other like the tubes of a telescope.

The upper primary spathes become gradually shorter and narrower, and the ultimate ones help to form the slender filamentous flagellum.

XIII.–The Partial Inflorescences.

From or near the mouth of every primary spathe, except the outermost, springs, usually distichously, a partial inflorescence. The number of the inflorescences varies both according to the species and to the strength of the individual plant.

In several species the partial inflorescences end in a spikelet larger than the lower ones; in others, laterally to the uppermost spikelet springs a more or less distinct caudicle formed of diminutive sheathing spathes and representing the prolongation of the axis.

The lower inflorescences of a spadix are almost always larger and more branched, and bear more spikelets than the upper ones; there is a gradual diminution in size, degree of branching and number of spikelets of the inflorescences from the base of the spadix towards the apex, where the partial inflorescence is not infrequently reduced to a few spikelets or even to a single spikelet.

The spathes which sheath the axis of the partial inflorescences follow the same rule as the primary spathes, from which indeed they do not essentially differ, and become gradually shorter and narrower as they approach the apex.

XIV.—The Spikelets.

The ultimate divisions of the partial inflorescences bear small axes beset with flowers which may be considered spikelets, which name I find preferable to that of "Juli" employed by Martius. The name "Julus" or "Amentum" (*Catkin*) is usually applied to a cylindric inflorescence where the flowers are attached all round a central axis, whereas in the spikelets of *Calamus* the flowers are almost always regularly arranged in two series right and left of the central axis so that the spikelets appear flattened exactly as in many *Gramineæ*.

Owing to this bifarious arrangement, the flowers when very close together and disposed in the same plane, render the spikelets comb-like or pectinate. Not infrequently, however, both series of flowers are more or less assurgent and point upwards so that the spikelets acquire a scorpioid tendency, as for example in *C. Gamblei*, and *C. Huegelianus* and in most of the species of the groups to which *C. exilis* and *C. heteracanthus* belong.

In a few instances the disposition of the flowers is not clearly evident. In *C. gonospermus*, for example, it is not easy to make out whether the spadix is composed of short spikelets with closely packed glomerulate flowers or of contracted partial inflorescences in which what appear to be glomerules of flowers are contracted spikelets. In *C. Lobbianus* also the spikelets are short and dense and their original structure, especially when they are laden with fruits, is difficult to recognise.

With the single exception of *C. polystachys* only one spikelet, in all the known species of *Calamus*, arises from every secondary spathe. In *C. polystachys*, however, in the lower part of the inflorescences there are 2–3 spikelets in the axil of each secondary spathe, though towards the top the spikelets are solitary.

As a general rule the lower spikelets in every partial inflorescence are larger than the upper ones; these gradually diminish in size and number of flowers, the uppermost being the smallest.

Most usually the spikelets are inserted at or near slightly above or inside the mouth of the corresponding spathe; but in some species, for instance in all those belonging to the groups of *C. castaneus*, *C. zeylanicus* and *C. Zollingerii* they are attached to their base by means of a pedicellar part as long as the spathe from which the spikelet emerges (PLATE II, fig. 2). If the spikelets be pedicellate even the flowers, as will be seen presently, are borne on pedicellate involucres.

The appendicular organs of the spikelets which are spathes of a reduced or diminished nature are termed "spathels." Even when the primary and secondary spathes are prickly the spathels are always unarmed; the only exception known to me is in the VAR. *insularis* of *C. paspalanthus*, where the spathels are provided with one or two diminutive claws; usually however when the secondary spathes are scabrid, a similar scabridity is present on the spathels and even on the involucres.

The various appendicular organs of the spikelets are of much diagnostic importance, but it is not always easy to establish their nomenclature; and to be certain of their exact morphological nature it is essential first to know the sex of the spikelets because the appendicular organs or involucra of the flowers are not the same in the male and female spikelets.

Male Spikelets.—The male spikelets of *Calami* are of simpler structure than the female ones, since the flowers in the first have only one proper involucre (PLATE I, figs. 1–3) while in the second the involucre is double (PLATE I, figs. 8–12), moreover, the male spikelets have only one kind of flower, and the flowers with their involucres are solitary in the axil of every spathel (PLATE I, figs. 1–3), while the female spikelets have always at least two flowers to each spathel (PLATE I, fig. 10) of which one is female, the other is more male than female, but is sterile and speedily deciduous.

In the male spikelets the partial inflorescences are usually branched two or three times and the division or branchlets which remain in their basal portions may be considered to be compound or branched spikes, while the ultimate divisions of these are the true or simple spikelets.

As regards size, the different divisions of the inflorescence and the spikelets follow the general rule; the upper branches and spikelets are gradually smaller than the lower ones and every partial inflorescence assumes a more or less pyramidal form, The terminal spikelet of each division is usually considerably larger than the others.

The male spikelets are almost always shorter and more densely furnished with flowers than the female ones.

The axis of the male spikelets is clothed with spathels which are commonly broadly and asymmetrically infundibuliform (Plate I, fig. 1*k*, and Plate II, fig. 4*k*); sometimes, however, their tubular part is so short that they look like bracts or are boat-shaped or spoon-shaped with the axis passing excentrically through them; the spathels are rounded on one side and slightly prolonged on the other, the outer, into a small point.

In the axil of each spathel is a flower with its special involucre (Plate I, fig. 1*b*, and Plate II, fig. 4*b*). The involucre has usually the form of a small cup (Plate I, figs. 1–3*b*), being more or less concave; in a few instances we find in place of the involucre two small scales or bracteoles united by their bases which clearly explain the origin of the involucre from two coalescing appendicular organs; for example in *C. asperrimus*, *C. siphonospathus* and others.

Authors usually term the involucre a "spathellula," a name that may easily be mistaken for that of a "spathella," and one that, as we shall presently see, has not been always properly and uniformly applied. In the simple spikelets it is always easy to distinguish the spathels from the other appendicular organs as it is from the axils of these spathels that the flowers arise; but in the case of compound or branched spikes it is a spikelet, which has its own spathels, that is situated in the axils of a spathel; in this case therefore we have primary, secondary, and even tertiary spathels, according to the degree of division of the primary spike. But all this is of very slight importance since, as a rule, the secondary and tertiary spathels differ from the primary only in size. It is sufficient if we hold that in a male spikelet we mean by a spathel the appendicular organ which clothes the axis of a spikelet—whether of a primary or a secondary spikelet is of no consequence—and that a spathel of the ultimate branching protects a flower which in turn has its base enveloped by a special involucre.

The modifications, peculiarities and diagnostic characters afforded by the spathels are essentially the same as those of the female spathels to be described further on; but as a rule the spathels of the male spikelets are shorter, broader, more distinctly infundibuliform and more closely packed than those of the other sex. The flowers of the male spikelets are solitary in the axil of each spathel except in a very few species, such as *C. viminalis*, *C. pseudo-tenuis* and some few others. In *C. viminalis* I have counted as many as 8 glomerulate flowers to each spathel; but in this case the glomerules must be considered secondary much reduced spikelets as each flower is provided with its own diminutive bracteole.

Female Spikelets.—The female spikelets are as a rule more elongated than the male ones and though the flowers are bifarious they are more remotely disposed.

The female spikelets also have their axis constantly clothed with tubular or slightly infundibuliform spathels but these are longer and less distinctly infundibuliform than those of the male spikelets and are not infrequently represented by membranous rings round the axis of the spikelets with which in their lower part they are organically fused (Plate I, figs. 8–12*k*, and Plate II, figs. 1 and 3*k*). It is therefore often difficult to distinguish externally the point where the spathels are differentiated from the axis.

In some cases the spathels are much reduced in size, are devoid of any tubular portion and resemble bracts. The morphological structure of the female spikelets does not differ essentially from that of the male, but in the female the appendicular organs together with the flowers which arise from the axil of or above each spathe must be considered in their entirety as a secondary much contracted spikelet. This mode of interpreting the female spikelets of *Calami* is in accord with the general plan of division of the spadices, and assumes that it is supra-decompound as is almost universally the case with the male spadices. According to this interpretation the female spikelets would also have been supra-decompound if the small contracted spikelet existing at each spathel had undergone further development.

The flowers of the female spikelets are inserted, like those of the male ones, in or a little above the axils of their respective spathels, but in the female spikelets the female flower has two involucres in place of one. And from the descriptive point of view it is most important to fix the nomenclature of these two involucres.

The organ which remains inside or a little above each spathel and which is immediately in contact with the axis of the spikelet has been termed by me an "involucrophorum"; it corresponds with the "spathellula" of Martius and with the "bract" or "bracteole" of Griffith.

I have not considered it advisable to retain the name of spathellule for the involucrophore, because this does not correspond morphologically to what has been termed the spathellule in the male spikelets and because it appears to me to be an organ of axial rather than of appendicular structure. The name spathellule implies a morphological agreement with the spathel to which it should bear the same relationship as the spathel does to the spathe or as a secondary spathe does to a primary one. As a matter of fact, however, the "involucrophore" appears to represent the shortened or contracted axis of a small spikelet, provided with its spathel and bearing besides its appendicular organ which is the involucre. This structure is very evident in those species that have the spikelets inserted at the base of their own spathe, as in *C. Burckianus*, *C. Zollingerii*, *C. Griffithianus*, etc., when the involucrophore both emerges from the base of its own spathel and is more or less pedicellate (Plate II, figs. 6–9*a*).

The precise place of insertion of the involucrophore is not always at the base of its spathel, but is much more frequently just at its mouth or a little above or below the mouth. When the involucrophore is inserted outside its own spathel, it generally seems attached to the axis of the spikelet; but in fact it adheres laterally to the base of the spathel above that in the axil of which it ought theoretically to have originated (PLATE II, fig. 1*a*). The essential part of the involucrophore is a small calyx, cup, cuplet or disk which corresponds to a spathel and is most usually sessile; in several species, however, it is more or less narrowed to the base, as in *C. Griffithianus* and *C. Zollingerii* (PLATE II, figs. 6–8*a*) or is even distinctly pedicellate. The latter condition is very evident in *C. symphysipus*, *C. heteracanthus* and allied species, in *C. exilis* and allied species, and in *C. unifarius* VAR. *Pentong* (PLATE II, fig. 1*a*). The pedicel of the involucrophore in the species mentioned clearly demonstrate the axial origin of the involucrophore.

The involucrophore is never absent from the female spikelets and presents important diagnostic characters in its shape, and in its mode of insertion, whether sessile or pedicelled, included in or exserted from its own spathel, free from or partially adnate to the spathel above its own. As the involucrophore represents a contracted branchlet, or the axis of a rudimentary spikelet, emerging from the axil of its spathel, it reproduces the peculiarities inherent in all the other divisions of the spadix and just as at the insertion of the spikelets there is a specialized swelling or callus, which I have supposed to be nectariferous, we find this same callus with its transverse cleft or rima repeated in the axil of the involucrophore (PLATE II, fig. 1*i*).

Within the involucrophore and usually moulded on this is the proper involucre of the flower which corresponds exactly with the involucre of the male spikelets. Had we made use of the term spathellule for the second appendicular organ of the male spikelets, we ought to have used this term also for the involucre of the female spikelets and not for the involucrophore, a usage that must have led to confusion.

The involucre in female spikelets is usually concave and cupular so as to admit of the reception of the base of its flower; its margin is truncate and usually entire, but on the outer side it is more or less distinctly marked by two small teeth, between which the margin is more or less deeply lunately excised. Sometimes the involucre is almost explanate and discoid or even appears as if made up of two bracts, which in a few instances are almost separate, the apices of these bracts corresponding with the teeth of the involucre when it is cupular. On the involucre of the female flower externally, on a peculiarly shaped surface corresponding in position to the lunate excavation of the margin, is invariably inserted a neuter flower (PLATE I, figs. 8, 10, 11*c*).

The small usually sharply defined surface on which the neuter flower is inserted I have termed the "areola" of the neuter flower. This areola is most usually lunately shaped, somewhat depressed or developed more in breadth than in height, with the horns corresponding to the two marginal teeth. Sometimes, however, it is more developed vertically than horizontally and assumes a more or less ovate or lanceolate shape as in *C. Griffithianus* (PLATE II, fig. 8*c*), or is more or less concave or subinvolucriform, as in *C. deerratus*. The areola is not, however, always sharply defined; in some cases it is depressed or linear, or its place is simply marked by a small callosity (PLATE II, fig. 1*c*) or by a punctiform scar. Sometimes too its place is taken by a very short pedicel which supports the neuter flower, as in *C. adspersus* and *C. Henryanus;* this pedicel evidently represents there a second joint of the small and contracted spikelet from which the fertile and the abortive flowers spring. In *C. Cumingianus* and *C. nitidus* the neuter flower has at its base very small bracteoles of its own which may be taken as representing the rudiments of a second involucre. The involucre of the female flower, as has been already pointed out, is evidently formed by the coalescence of two appendicular organs or bracteoles. Proof of this origin of the involucre is derived from the disposition and direction of its nerves, which converge to two opposite points on the margin and precisely to the two small horns or teeth of the areola mentioned above. Moreover, the nerve, which ought to correspond to the mesial costa of the bract, is often prominent and forms a keel so that the floral involucre besides being bidentate is often even 2-keeled on the side next to the axis.

In some few instances two fertile flowers originate from each spathel, as in *C. fertilis*, *C. didymocarpus*, *C. pachystachys*, *C. siamensis* and occasionally also in *C. deerratus*. In *C. fertilis* at each spathel a single involucrophore bears two cupular involucres of equal size and similar shape (PLATE 230, fig. 5), and each involucre bears its own sterile flower; the same condition occurs occasionally in *C. didymocarpus* (PLATE II, fig. 3). In the other species mentioned the second fertile flower arises from what ought to have been the areola of the neuter flower and in this case the areola itself is larger, deeper and subcupular.

In the female spikelets each female flower is accompanied by a sterile one; when, therefore, as in *C. tenuis* this is highly developed, the spikelets, immediately prior to the opening of the flowers, display two distinct series of fertile and two of sterile flowers, or four series in all. *C. siamensis*, which has two fertile flowers to each spathel, has therefore four series of fertile flowers, and as each pair of fertile flowers is accompanied by one rather distinct neuter flower, the total number of series of flowers is six. Finally in *C. fertilis*, where each of the two flowers belonging to each spathel is accompanied by a sterile one the total number of series of flowers is eight.

XV.—The Flowers,

I have already explained how in the male spikelets the flowers arise from or near the axil of every spathel and how they are arranged right and left in two longitudinal series, these being in one plane or being more or less assurgent.

I have also pointed out that in the male spikelets the flowers are solitary on each spikelet, and that in only a few cases (*C. viminalis*, *C. pseudo-tenuis*) in place of a single flower there is a glomerule of flowers representing a contracted secondary spikelet.

The bifarious arrangement of the flowers on one plane is the most usual, and in this case the spikelets are broad, flat and straight or slightly curved; in several species however the spikelets assume a scorpioid tendency, because the two series of flowers are assurgent and point upwards and are secundly arranged as in the scorpioid cyme of a *Heliotropium;* this arrangement obtains in species of the groups of *C. exilis*, of *C. heteracanthus* and of *C. Huegelianus*.

In the female spikelets also a solitary female flower usually arises from each spathel, but this is accompanied by a neuter flower. If this be of large size and long persistent, the spikelets appear to have four series of flowers, as in *C. tenuis*, *C. javensis*, etc.; but when the neuter flowers are very small, and after the neuter flowers fall, the female spikelets also appear to have biseriate flowers. For the exceptions to this rule see the preceding section under the heading "Female Spikelets."

Male Flowers.—The flowers of both sexes in *Calamus* are small and unobtrusive. The male flowers are most frequently larger and more elongated than the female ones, but even the largest, as in *C. erectus*, *C. longisetus*, *C. arborescens*, *C. Flagellum*, *C. Thwaitesii*, etc., rarely exceed 1 cm. in length; they are green or yellowish and are always of a coriaceous or pergamentaceous texture.

The calyx of the male flower is shortly tubular, cupular or urceolate, and is always more or less deeply 3-toothed or 3-lobed (PLATE I, fig. 4). The corolla is always considerably longer than the calyx, and is divided almost to the base into 3 narrow segments (PLATE I, figs. 4 and 5). The stamens are 6 in number and most frequently are uniseriate, and have subulate filaments with a more or less distinctly inflexed apex. In *C. pachystemonus* and allied species the stamens are distinctly 2-seriate, three of them being, moreover, shorter than the other three, while their filaments are not inflexed at the tip, so that the anthers in bud as well as during flowering are erect and basifixed. When the filaments are inflexed the anthers are versatile and deeply divided at the base (PLATE I, fig. 17, and PLATE II, fig. 5). In all the male flowers that I have examined I have always found a rudimentary ovary composed of 3 small elongated bodies or rudimentary carpels (PLATE I, fig. 6*n*, and PLATE II, fig. 5*n*). I have never met with the faintest sign of a nectary in the interior of a male flower.

Female Flowers.—The female flowers are usually shorter and stouter than the male ones and are ovate or conic in shape; their calyx is cupular—urceolate or subcampanulate and always more or less deeply 3-toothed or 3-lobed (PLATE II, figs. 6–11). The corolla is always more deeply partite than the calyx, but its divisions very seldom exceed the teeth of the calyx; in a very few cases, as for instance in *C. javensis*, the corolla of the female flower is conspicuously longer, and in *C. adspersus* is slightly shorter than the calyx.

The stamens of the female flower are six in number and are always sterile; the bases of their filaments are slightly connate to form a cup or urceole which envelopes the ovary and is crowned by 6 more or less elongated teeth; these teeth bear sagittate basifixed but abortive anthers (PLATE II, fig. 11).

The ovary is globular, ovate-conic or even turbinate, and does not differ essentially from that of the other *Lepidocaryeæ*, of which the chief characteristic is a "lorica" formed of imbricated scales (PLATE II, fig. II). The ovary is trilocular, with the 3 cells separated by very thin dissepiments; each cell has a solitary ovule which is anatropous, basilar, and inserted on the inner angle of the cell. Most usually only one of the ovules grows to maturity, and of the others only the remains may be traced in fertilised ovaries. Perhaps the dissepiments of the cells are frequently incomplete from the first formation of the ovary and the three ovules stand erect in the centre of the ovary; this at all events is what has seemed to me to be the case in dry specimens of *C. Zollingerii*.

The style is usually very short and comparatively stout; the stigmas are 3 in number and are usually rather stout, elongate-trigonous, acuminate or subulate, lamellose inside, spreading and recurved when the flower opens (PLATE II, figs. 6, 7, 8, 10 and 11), and are usually persistent even when the fruit is mature.

Neuter Flowers.—In the female spadix the fertile flower is accompanied by a neuter one (PLATE I, fig. 10*f*, and PLATE II, figs. 6, 7*f*) which is frequently very small and very soon deciduous, but not rarely is similar to a perfect male flower, though thinner and with attophied anthers and abortive ovary; this is formed—as in the male flowers—of three very small bodies, the representatives of three carpels (PLATE II, fig. 12*n*). The neuter flower is always inserted on the outer side of the involucre in the centre of the special area or niche which I have termed the areola of the neuter flower.

The neuter flower is almost always sessile, but I have found that it is provided with a distinct stalk in *C. Henryanus* and *C. adspersus*. In some species, as *C. salicifolius* and *C. Rotang*, the neuter flowers do not differ in appearance from the fertile male flowers, but I do not know if the pollen of their anthers be perfect and capable of fertilizing. In *C. tenuis*, *C. Guruba* and again in *C. Delessertianus* and *C. Ridleyanus* the neuter flowers are also well developed, and are only slightly smaller than the female ones; as they are only deciduous when the female flowers are on the point of expanding, the female spikelets immediately prior to the opening of the flowers have these arranged in four very distinct and almost similar series.

From the manner in which the neuter flower is inserted outside the floral involucre and on account of the small axial part with which in a few cases it is furnished, we can readily recognise that, along with the corresponding female flower, it forms part of a very small secondary contracted spikelet.

The neuter flower may therefore be considered to be a male flower which is rendered functionless by a retrograde process and becomes depauperated owing to the greater development of the fertile one or perhaps it may, from another point of view, be considered one that has never attained the full structure fitting it for reproductive functions.

It happens sometimes in nature that certain structures, which have made their appearance at an early date (in the evolutionary sense) under the stimulus of a definite need of the organism, and have been capable of fulfilling a definite function, later on, under altered conditions of existence, have become useless and have consequently been modified and reduced by atrophy, but still prsiest, possibly because the disuse began to be experienced when the malleability of the organism was already greatly diminished. All this is in accordance with my theory of variability restrained by the force of heredity in the plasmatical era.[*]

These neuter flowers therefore appear to me to be a striking proof of the presence in an organism of useless structures that do not now exercise any function, or that perhaps never even in bygone times exercised any function.

The neuter flowers of *Calami* usually never open; they have stamens and an ovary that, according to the species, are more or less atrophied, and that are deciduous before the fall of the female flowers. There seem however to be a few exceptions to this rule, as for example in *C. Griffithianns* (PLATE II, fig. 12) where the calyx and corolla apparently expand.

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[*] Beccari: Nelle Foreste di Borneo *loc. cit.*

XVI.—The Fruiting Perianth.

In all the species of *Calamus* the perianth formed by the calyx and corolla is persistent till the fruit reaches maturity, and usually it is unaltered or at most slightly hardened.

The fruiting perianth affords a good diagnostic character, as in some species the calyx and corolla are split to the base and their segments remain spread under the fruit where they form a kind of six-rayed star. In many other species the tube of the calyx is more or less cylindric, hardens a little after the fertilisation of the ovary, becomes callous and even sometimes slightly swollen at the base and as a whole gives rise to a kind of stalk or pedicel to the fruit.

Whether the fruiting perianth be explanate or pedicelliform, we may always, owing to its different parts remaining unaltered, recognise from it the structure and the size of the female flowers.

When the fruiting perianth is pedicelliform the fruit is usually provided at its base with a small caudicle penetrating into the cavity of the perianth.

XVII.—The Fruit.

The fruit of *Calamus* does not essentially differ from that of the other *Lepidocaryeaœ* It has by Martius been termed loricate or mail-clad, on account of its pericarp which, owing to its being composed of numerous, regularly arranged, thin, resistent, retrorse scales, forms a kind of plated armour for the seed. This structure is unique in the vegetable kingdom.

The fruit of *Calamus* is more or less globular, ovoid, ellipsoid, oblong, conical-ovoid or even slightly turbinate; it is always comparatively small, and varies from 4–5 mm. in length in *C. microsphaerion*, *C. siphonospathus*, *C. microcarpus*, etc., to 4 cm in *C. erectus*. Among species that possess a large fruit may be mentioned *C. Flagellum*, *C. khasianus*, *C. nambariensis*, *C. Manan*, *C. simplex*, *C. ornatus*, etc.

The fruit of *Calamus* remains the same in the dry as in the fresh condition, but on account of the scaly nature of the pericarp it varies somewhat in size according to its degree of maturity, inasmuch in the fresh fruit the seed is often enveloped in a fleshy integument, which when the seed is mature exerts a degree of pressure against the pericarp that causes an expansion of this, which is comparable to the expansion of the skin of a snake when its body is distended with food. And, in reality, the hard scales of the pericarp in a *Calamus* fruit are joined together by an elastic and extensible tissue exactly as the scales of the skin of a snake are.

The scales of the fruit of *Calamus* afford good diagnostic characters by their shape, their colour, the peculiarities of their surface and margin, their number and their disposition. Martius has discussed the phyllotaxis of the scales of the fruit of *Calamus* at great length, and I have nothing to add to his very complete study. I have only to say that in my descriptions I have only given a certain amount of weight to the characters drawn from the number of the longitudinal series or vertical rows, termed "orthostichies," according to which they are apparently arranged round the fruit. The smallest number of these vertical rows observed by me is 12 in *C. Kunzeanus*, *C. nematospadix*, *C. digitatus*, and *C. microcarpus*, while the largest is 24–27 in *C. castaneus.* The number of the series or rows is usually a multiple of 3, but in some fruits one of the series may at times be partially missing, so that the rule does not always hold good. The number of orthostichies is as a rule rather constant, and the variation that occurs in each species is confined to narrow limits. The greatest difference in the number of orthostichies observed by me has been in *C. fasciculatus*, in some varieties of which I have counted 20, in others 14. As has been already said, the number varies from 24 to 27 in *C. castaneus.*

The morphological nature of the fruit-scales of the *Calami*, as of other *Lepidocaryeæ*, is not thoroughly known. A. Braun has considered these scales to be leafy structures; they appear to me however to be rather hypertrophic or hyperplastic products or outgrowths of the epidermal tissue, analogous to the spinules, bristles, hairs and such like growths so frequent on the surface of the leaf-sheaths, the spathes and even the leaves of every *Calamus.* Martius considers (Hist. Nat. Palm. vol. III, p. cxlix) their very regular and surprising phyllotaxis to be against this hypothesis.

According to my view the scales of *Lepidocaryeæ* correspond to the spiculæ which grow on the fruits of some *Cocoineae*, as on those of some species of *Astrocaryum* and *Bactris.* In connection with this opinion it must be called to mind that the scaly coating or spinosity of the fruit in Palms always occurs in plants which are abundantly furnished with spines in other parts of the plant, as if its epidermal tissue were endowed with the faculty, of producing spinous hyperplasia on the homologues of the leaves, as the three carpels composing the ovary of a *Calamus* morphologically are.

My view then is that the scales of *Lepidocaryeæ* are no more than the homologues of the spinules, hairs or bristles that are to be observed on the nerves of the leaves in almost every species of *Calamus.*

The hyperplastic epidermal origin of the scales of *Lepidocaryeæ* is almost evident in the fruit of *Myrialepis Scortechinii,* where the scales are excessively minute and numerous and are reversed in the fruit, but are falcate, ascending, and inserted normally on the surface of the young ovary, as is seen when a longitudinial section of the ovary is made.

XVIII. The Seed.

Under the scaly peiranth there is usually a solitary seed; this, in the fresh state, is enveloped by its proper integument which is sometimes thin and dry, but is not infrequently, considerably developed, often fleshy, mucilaginous or acid, and in this case is not unpleasant to the taste; or is even loaded with tannic substances and astringent. In the dry fruit the integument is usually thin and adherent to the seed and more or less crustaceous, and often brittle when it originally was fleshy. The integument of *C. aquatilis* is of a very special structure because, besides the fleshy tissue of which it is composed and which after maturity is in time absorbed, it contains numerous persistent short fibres attached normally to the testa of the seed and entirely clothing its surface with a velvety-pubescent covering.

In a few species, like *C. trispermus* and *C. manillensis* there are three fairly equally developed seeds in each fruit; *C. Burckianus* also has as a rule three seeds, but occasionally only one developes fully and only a conspicuous rudiment of each of the two others remains. When there are three seeds they are convex externally and have two flat facets which meet at a central obtuse angle. In *C. Huegelianus* and *C. digitatus* there are occasionally two seeds and then they are plano-convex.

Excluding these few exceptions, the fruit of *Calamus* as a rule contains only one seed, and the remains of the other two are absorbed; this seed is commonly globular or ovoid or even slightly flattened and sublenticular; exceptionally it is very irregularly shaped and angular as in *C. paspalanthus*, *C. gonospermus* and *C. ornatus*. The seed of *Calamus* is always erect in the fruit, and even when it is flattened or lenticular its longer axis is the vertical one.

In most seeds of *Calami* it is possible to distinguish a dorsal and a ventral side, the dorsal being usually convex, while the ventral has generally in the centre a circular or elliptic depression (PLATE 230, figs. 16, 18, and 19) termed the "chalazal fovea," which in the seeds of several species is represented by a longitudinal furrow or even by a small inconspicuous rib. The exact situation of the chalazal fovea, though sometimes only faintly indicated, is always distinguishable even when the seed is globular.

The surface of the seed is rarely, as in *C. paspalanthus*, quite smooth; most frequently it is marked by small impressions, pits or alveoli, and furrows with corresponding ridges, wrinkles, small tubercles, and similar irregularities; these ridges and furrows often radiate from the chalazal fovea.

The proper integument of the seed, as has already been noted, contains at times tannic substances, and this is usually the case when the surface of the seed is irregular and especially when it is pitted and the integument penetrates more or less into the substance of the albumen. When the intrusions of the integument are superficial, the albumen cannot be considered ruminated, but in not a few cases the depressions on the surface of the seed are very deep, and sometimes these are developed into true narrow channels so that the albumen is rendered typically ruminate. This is a condition that obtains in the seeds of species of the allied genus *Daemonorops*; in this latter genus, however, a reminated seed is the rule, whereas in *Calamus* it is the exception; in both cases the channels are filled with a brown astringent tannic substance.

In the integument of the seed of *C. Flagellum*, when dry, I have observed numerous oblong or fusiform small bodies of a garnet-red colour visible even to the naked eye, but of course much more obvious with the aid of a lens; these bodies seem to be mucilaginous masses infiltrated with tannic acid, which fill corresponding lysigenetic cavities of the integument. The rumination of the seeds of *C. ciliaris*, *C. exilis* and allied species is of a very special nature. In these the seed is deeply and boldly plicate and has a cerebroid appearance; the integument is very thin, penetrates into the folds, many of which radiate from the chalazal fovea, and is formed of a few layers of parenchymatous cells filled with very small green corpuscles partly soluble in water, to which they impart their colour and a very bitter taste. Dr. Veturia Bartelletti, who has made a special study of this substance,* states that it is probably a derivate of tannic acid.

In the genus *Calamus* the rumination of the seed is not of great taxonomic value, because it happens that of two species which, from many points of view, may appear very nearly allied, one may have homogeneous, the other ruminated albumen. It is not therefore possible to make use of the character of homogeneity or rumination of the albumen as a means of dividing *Calamus* into two principal sections.

Leaving out of account its rumination, the albumen of the seed of *Calamus* is always horny or bony. In the descriptions of the albumen it is termed homogeneous not only when it is really so, but often also when the intrusions of the integument are very superficial. The rumination of the seed is very apparent in *C. erectus*, *C. Flagellum* (and its allied species) *C. Huegelianus*, *C. Gamblei*, *C. gracilis* *C. melanacanthus*, *C. Diepenhorstii*, *C. macrosphaerion*, etc.

The embryo of the seed of *Calamus* is most commonly situated at or near its base (PLATE 230, fig. 13), but it is lateral and opposite to the chalazal fovea in *C. exilis*, *C. ciliaris* and other species of the group. It is also lateral in *C. gracilis* and *C. melanacanthus* which have, besides, a ruminated albumen, while in *C. Kunzeanus* it is lateral and the albumen is homogeneous (PLATE 230, figs. 18, 19).

XIX.—Extra-floral nectaries.

So far as I know nectarifluous surfaces of any kind have seldom† been observed in the flowers, and never hitherto in any of the other organs of Palms. It appears to me, however, that certain special swellings or callosities, which frequently exist in certain definite positions, in not a few species of *Calamus*, should possibly be considered extra-floral nectaries.

I have already alluded more than once, in passing, to the existence of these supposed nectaries, which are to be met with: 1st, at the insertion of the leaflets on the rachis in their upper axil; and, in the hollow formed by the folding of the leaflets at their base, just at their insertion in the lower surface; 3rd, at the insertion of the spadices and flagella; 4th, in the axil of every branching of the spadix and its subdivisions, such as the spikelets and the involucrophora.

I have never had any opportunity of studying these nectariform surfaces, as they may be termed, in a fresh condition; in dry specimens it is difficult to investigate their true nature. These surfaces always have the appearance of small swellings of a lighter colour than the adjacent tissue and are formed by two lips, more or less tumescent, separated by a cleft or rima, which may be supposed to be, in some cases, nectarifluous.

Most *Calami* are provided with these structures, which are particularly conspicuous in the axils of the leaflets of *C. perakensis* and *C. ramosissimus*, and are extremely developed at the junction of the partial inflorescences with the axis of the female spadix and in the axil at the insertion of the spikelets in *C. paspalanthus*. As good examples of the supposed nectariform structures situated in the axils of the involucrophora I may cite *C. Gamblei*, *C. unifarius* var. *Pentong*, *C. adspersus*, etc., and for those found in the fold of the blade of the leaflets at their base in the lower surface may be quoted *C. aruensis* and *C. Hollrungii.*

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* Bull. Soc. Bot. Ital. 1904, p. 309.

† *Vide* Delpino in Nuovo Giorn. Bot. It. II (1870), p. 61.

Usually we observe axillary nectariform callosities on the spadices when the partial inflorescences are situated outside the mouth of their respective spathes; and most commonly, where the larger branches of the spadix are provided with an axillary callus, these appear also at the successive divisions and even at the insertions of the spikelets and of the involucrophora.

The essential requisite for a nectarial structure is the secretion of sweet fluids; therefore in *Calamus*, the transverse rima of the callus, if this be really a nectary, ought to be the opening for the exudation of such fluids; but in the herbarium specimens examined by me, I have never been able to discover the slightest sign of their presence, nor have I seen any indication of their having been resorted to by insects of any kind, in search of nectar.

It is only from observations on living plants that we may acquire any definite knowledge of the nature of the nectariform surfaces of *Calamus.*

XX.—Calami under Cultivation.

Although the species of *Calamus*, the cultivation of which has been attempted in the hot-houses of extra-tropical countries are pretty numerous, the number of those which have become permanently established is small, owing to its being very difficult to provide them with conditions of existence like those enjoyed in their native countries. The *Calami* in our hot-houses therefore give but a faint and poor idea of the elegance of their foliage as it appears at the summit of a long slender and climbing stem. Young plants of *Calami* are, however, considerably appreciated by horticulturists on account of their highly ornamental, bright green, graceful pinnate leaves, so that they are frequently offered for sale in commercial catalogues of living plants.

But the names by which cultivated *Calami* are known to horticulturists are, with hardly an exception, incorrect; and since, on the other hand, horticulturists are in the habit of putting on the market small seedlings or very young non-characterized plants, the foliage of which usually exhibits much uniformity in the various species and always differs considerably from that of the adult plant, it becomes very difficult for a botanist to reduce the species rashly proposed by horticulturists as new to their true position in scientific nomenclature.

I have been able, from specimens of leaves of cultivated plants preserved in the Herbaria at Kew and Berlin, to establish the fact that many of the supposed *Calami* are species of *Daemonorops*, for it appears that some species of this genus are more easily cultivated than most species of *Calamus*, but I have very seldom been able from specimens of this kind to determine the actual species to which they belong.

In very many cases the exact naming of these horticultural *Calami* has been rendered quite impossible owing to the fact that their appearance in European hot-houses has been quite ephemeral, and that many with newly proposed names have disappeared for ever from cultivation.

In the French edition of Nicholson and Motetts *Dictionnaire d'Horticulture* 2I cultivated species of *Calamus* are enumerated and many of them bear the names of very well-known species, but, as it appears to me, in almost every instance misapplied. In the "Report on the Progress and Condition of the Royal Gardens at Kew" for the year 1882, 37 species of *Calamus* are recorded as under cultivation at Kew.

So far as I know the only species that have succeeded in producing flowers in Europe are *C. ciliaris* (Gard. Chron., Feb. 6, 1897, p. 86, fig. 23) and *C. javensis* of which last I have seen a specimen from a plant that flowered at Kew under the name of *C. trinervis*. At Kew also *Daemonorops Jenkinsianus* has reached a fair flowering state.

The plants of *Calami* never have deep roots, and they acquire a luxuriant habit in the superficial layer of humus of the tropical forests, when this overlies a silicious sub-soil, because *Calami*, like almost all other kinds of Palms, avoid a calcareous sub-soil.

In cultivation *Calami* thrive best in a compost of equal parts of sandy loam and vegetable soil formed by decomposed leaves. They require a warm moist atmosphere and copious watering. I have however to observe that *Calami* grow in very different situations, from marshy plains at the level of the sea up to an elevation of 2,000 metres in the mountains, so that in the cultivation of *Calami*, as in that of any other plant, it is necessary to know beforehand the natural conditions of their existence and to modify their cultural conditions accordingly. If this be borne in mind, it may be found that probably not a few of the mountain species of *Calamus*, as for instance those of the Himalaya and Assam, will thrive better in the temperate than in a warm hot-house, while others should receive the treatment of aquatic plants in warm water.

So far as my knowledge goes, no attempt has been made to cultivate any of the economic sorts of *Calamus* in their native countries or in countries with an analogous climate . Only *C. khasianus* appears to receive a primitive cultural attention in Assam for the sake of its fruits, which are eaten as a substitute for those of the Areca Palm.

XXI.—Uses of, Trade in, and Native Names of Calamus.*

The long and slender stems or canes of *Calami* when divested of their sheaths are usually known by the Malay name of "Rotang," commonly altered into "Rattan" or "Ratan," and are put to various uses according to their size, length, flexibility, elasticity and toughness.

The most slender canes are those produced by *C. javensis* and its varieties, and by allied species. They are employed entire for binding purposes, and in making chairs, blinds, mats, wicker- or basket-work, fishing implements, etc.

The largest and more resistent canes, such as those of *C. rudentum*, *C. ornatus*

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* As regards the Economic value and domestic employment of *Calamus*, besides the great works of Blume (*Rumphia*) and Rumph (*Herbarium-Amboinense*), the following may be consulted; with, however, the caution that the names assigned by many authors to the economic species are not to be relied on:—

J. Forbes Royle: The Fibrous Plants of India, p. 92.
Brandis: Forest Flora of North-West and Central India, p. 558.
Gamble: A Manual of Indian Timbers, New edit. (1902), p. 734.
Hasskarl: Aantekeningen oer het nut, door de bewoners van Java, etc., p. 51, especially with reference to the species of Java.
De Mercado: Libro de Medicinas, in the Flora de Filipinas, Gran Edicion, vol. iv, p. 80.

C. palustris, *C. albus*, etc., are made use of entire as cables by the natives of the Malay Archipelago, Cochin China and neighbouring countries; large cables are also often made of many small canes twisted together; these, which are often of extraordinary strength and durability, are much employed for native craft such as Prahus and Junks. *C. palustris* is much used entire, in Burma, for tying timber in rafts and making the cables which stretch across the river at the Salween rope station (*Gamble*). To the same use are put the entire canes of *C. ornatus*, which are employed in Java for moving ferry boats. Usually, however, for many purposes the rattan canes are split throughout their length into 2–4 or more strips from which the inner soft brittle and spongy portion is removed by means of a knife or same other instrument, so as to leave the external portion, which is hard, tough, flexible, elastic and has its outer surface very clean and smooth as if it had been varnished.

The process of cleaning and reducing the canes of *Calami* into fine strips is termed by the Malays "raut" and from this word is derived "rautang," whence "Rotang," that is to say the object which it is possible to reduce to strips by the "raut."

The strips vary in width according to the use to which they are to be put; those for delicate work, as for the network of furniture, for small bags, hats, etc., are from 1–3 mm. in breadth; those employed as lashings in native house-building or in fastening the removable head of the Malay axe to its handle are from 5–6 mm. wide.

The natives often dye these strips of Rotang red when they desire to give a more elegant finish, by means of variegated patterns, to their work.*

The canes of some Rotangs are used entire and cut into pieces of appropriate length to make handles, rods, walking canes and the like. For this purpose the erect and slender stems of the non-scandent species, such as *C. bacularis*, are best suited; but the basal portion of certain of the scandent ones is sometimes employed. According to Gamble, *C. inermis* furnishes in the Sikkim Himalaya the best alpen-stocks. The well-known "Malacca canes" or "Pinang Lawyers" which are largely exported to Europe are cut from the stems of *C. Scipionum*. Their chief merit, apart from their toughness, their elasticity, and the beauty of their surface, lies in the extraordinary length of their internodes, a single one of these being sufficient to make a very elegant walking cane.

Rattans are a natural product of the primeval forest. Those that reach Europe are largely exported from Singapore, whence come all those that have been gathered in the forests of Sumatra, Borneo, Celebes, the Malay Peninsula, etc.

The process of collecting and preparing Rattans is very simple. When a Rotang plant has been found in the forest, the stem is cut near the ground and is detached from the trees, from which it is suspended by its hooked thongs, by taking a strong hold of its base and thus pulling down the entire plant with its leaves. In order to clean the plant of its leaves and especially of the spinous sheaths that clothe

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*The process of dyeing rattan canes red in the Philippines has been described by Father Llanos in the "Flora de Filipinas," Gran Edicion, vol. iv, p. 49.

the stem the top of the plant is cut off and then, handling it from the upper end, the stem is forcibly drawn in the opposite direction between two pieces of wood. In this way the stem is easily stripped of its spiny coverings and is then cut into lengths of about 5 metres each. These pieces are bent into two equal parts and fastened into bundles; in this state the canes are brought to the market. The Rotang which are thus prepared, and are most valued by traders, are not thicker than a man's little finger and have a fine polished straw-yellow glassy surface.

Some of the finest and most slender canes are preserved entire and are put on the market rolled up like coils of thick iron wire.

I have no reliable data as to the quantity of Rattan canes imported to Europe from Eastern ports. It is not even known what quantity is produced in each country. It is however certain that Borneo must supply a very large proportion of those that are put on the market, as we find from the Report of the Trade of Sarawak that from that town alone 27,784 piculs of Rattan were exported during the year 1899, and 31,200 during 1900, while some years before the supply had been still greater.

With the exception of the Malacca cane it is not exactly known from what species the rattans of commerce are obtained.

The indigenous names which I have always recorded when they were known to me may assist to a certain extent in the identification of the economic and commercial species, but it is a very well-known fact that native names are seldom to be relied on in a rigorously scientific sense.

Nor must we believe that all the species of *Calamus* produce a serviceable cane; in not a few of them the stem, though very long and flexible, is soft and brittle and therefore useless. Among Indian species to which this remark applies are *C. leptospadix* and *C. Flagellum.* On the other hand, the canes of *C. tenuis*, *C. Rotang*, *C. fascicularis* and *C. palustris*, and in lower India also those of *C. pseudotenuis*, are of very good quality and much appreciated. In the Nicobar Islands there is a great demand on the part of traders for the rattan of *C. nicobaricus*; *C. longisetus* is much used by the Andamanese. In Java the most useful canes are those of *C. javensis*, *C. viminalis*, *C. melanoloma*, *C. heteroideus* and *C. Reinwardtii*, especially the two last which, however, are less esteemed than those imported from Sumatra and Borneo. In the Philippines the rattan of *C. mollis* seems to be one of the most commonly used.

In the Malayan Peninsula there are certainly many species of *Calamus* that produce valuable canes; but, though the species of that region are comparatively well known scientifically, we are almost entirely ignorant to which of them the commercial canes that are brought by the natives fom the forests and sold to traders correspond. A *Calamus* which is termed there "Rotang Segu," and which I have identified with Blume's *C. caesius*, corresponds to the "Rotang Segah" of Borneo, also termed in Sarawak "Rotang Buluch," which is *C. optimus* Becc., a very near ally of *C. caesius.* In Sarawak this is undoubtedly the most esteemed Rotang among all the species known to the Malays; being one of those that are easily reduced to long strips it is much used for finer work on account of its very neat straw-yellow polished surface. Another species also much valued in Sarawak is the "Rotang baroh," *C. erioacanthus* Becc.

Among the best Rotangs of Sarawak I have to mention the "Rotang Perdas," *C. javensis* and *C. zonatus;* the "Rotang Sakkat," *C. muricatus;* the "Rotang Berman," *C. flabellatus;* the "Rotang Jangut" named also "Rotang batu" or "Rotang Kawat," *C. filiformis*, all of which produce a very long and resistent rattan. The last named is the smallest of all.

The Malay name Rotang is of rather wide significance and includes almost all the species of climbing *Lepidocaryeae*, especially those of the genera *Daemonorops* and *Korthalsia*, but the rattans which these last named Palms produce are not very slender and never have a vitreous polished surface. On this account they are not sought after by traders in spite of their being frequently very resistent and therefore largely used by the natives for many of the purposes which the canes of the true *Calami* subserve.

The natives of Malesia occasionally take advantage of the silicious coating of the stems of *Calami* for striking fire, and, moreover, Mr. E. H. Man tells us that the Andamanese contrive to make knives of pieces of the stem of *C. palustris* cut in such a way as to present a sharp edge.

The ruminated seed of certain *Calami*, being astringent, is sometimes eaten as a substitute for that of *Areca*. For this purpose the seeds of *C. erectus* and *C. Flagellum* are often used by the poorer people of India. The fruits of *C. khasianus* seem also to be employed in Assam in the same way, and according to a note by Mr. C. B. Clarke attached to a specimen in my herbarium, this species appears to be cultivated at Naughedam in Assam.

The pulp which envelopes the fruit of some of the larger species, such as *C. ornatus* and *C. Manan*, is edible, being white, acidulous and refreshing. According to E. H. Man the Andamaneese eat the cooked seeds of *C. longisetus*.

The long large leaflets of the fronds of *C. andamanicus* are employed in the Andamans for thatching.

A few, probably hypothetical, medicinal properties have been attributed to some species of *Calamus*. Rheede says that the fruit of *C. Rheedei* dried and powdered, heals ulcerated knees, and Rumph tells us that the ashes of the stem of *C. viminalis* mixed with *Arak*, are a remedy against the bite of venomous animals. The Javanese, according to Blume, attribute to the roots of *C. ornatus*, bruised in water, the property of alleviating the pains of labour, while Amboinese ladies, according to Rumph, use the water which flows abundantly from the stems of certain species when they are cut across, as a cosmetic to prevent the fall and increase the growth of their hair.

Blanco asserts that the fruit of *C. mollis* is considered in the Philippines to be poisonous, but I think this can hardly be possible. If true, this would be the only instance of a Palm containing a poisonous substance.

The native generic names for *Calamus* are numerous. Besides the universally known name of Rotang, we have the following:—

Uri, in Ternate;
Boucan, in Makassar;
Ua, in Banda and Amboina;
Bejuco (a Spanish name), in the Philippines;
Penjalin, Hoëh and Hooek (Huyk), in Java;
Khöe and Khöea, in China;
Mây, in Cochin China;
Bĕt, in Hindustani;
Vetra and Vetus, in Sanskrit.

As a philological curiosity I may suggest that apparently the names of many climbing plants, and especially of such as are employed for the purposes of tying and binding, like the Latin "Vitis," the Italian "Vetrice" (*Ligustrum*), "Vimine" and "Vinco" and the Latin "Juncus," the Anglo-Saxon "Welig," the English "Willow," etc., may have a common origin with the Sanskrit name for *Calamus*.

XXII.—Note on the Species of Calamus of the Philippine Islands.

Father Blanco in his "Flora de Filipinas" published in the year 1837 has given a very incomplete description of four species of *Calamus*, growing in these islands and named *C. mollis*, *C. gracilis*, *C. maximus* and *C. usitatus*. Besides these, three other *Calami* are mentioned, namely *C. Curag*, the *Calamus* of the island of Negros, and another with the native name of "Limoran." As there are no authentic specimens left of any of the plants of Blanco, we must be content, in trying to identify the species above noted, to work with only Blanco's descriptions.

C. mollis is apparently a common species in the Philippines for it has been met with again and again by all modern botanists and we may consider its identification as assured.

C. gracilis had its name changed to *C. Blancoi* by Kunth owing to the name *gracilis* having already been applied by Roxburgh to an Indian species. There is, it is true, no sufficient evidence that *C. Blancoi* of Kunth, to which have been referred the specimens of a *Calamus* distributed by Cuming under No. 1225, exactly corresponds with Blanco's plant; in the absence, however, of any type specimens we can agree to accept them as the same.

C. maximus I have found to be a local variety of *C. ornatus* Blume, and *C. usitatus* has been reduced by me to *Daemonorops Gaudichaudii* Mart.

C. Curag Miq., which is stated by Blanco to grow on Mount Angat, and to be a non-scandent plant, is not recognizable from the brief statement in which it was published by its author.

The *Calamus* of the Island of Negros is said to have black stems used in making walking canes and in the Novissima Appendix to the 'Flora de Filipinas' p. 276, it has been reduced to *C. Scipionum* VAR. *maculatus*; but the only thing, I believe, that is certain about it, is that it is a quite different species from *C. Scipionum*.

The *Calamus* with the native name of "Limoran" is supposed to be a *Zalacca* (*vide* Nov. Append. p. 274 under the heading of *Zalacca edulis*). De Mercado (*Flor Filip.* gran edicion, vol. iv, p. 50) considers it to be *Daemonorops Calapparius*, but on what ground it is difficult to say; I have found however the Tagala name of "Limoran" applied by recent collectors to *C. ornatus* VAR. *philippinensis.*

In the "Novissima Appendix" at pp. 275 and 356 there are 14 species of *Calamus* and 14 of *Daemonorops* recorded but happily no new names are proposed for them and all are reduced to already known species. Their identification however is based in most cases on the inspection of a portion of their dried canes, a most extraordinary proceeding, for every botanist who has made a study of *Calamus* knows how difficult it is to name the species even when in possession of good specimens. Owing therefore to the impossibility of recognising the species mentioned in the "Novissima Appendix" I have avoided quoting them.

There are now 17 species of *Calamus* (and 3 of *Daemonorops*) more or less completely known from the Philippines; all of them are endemic in these islands except *C. ornatus*, a Palm which grows also in Java, Sumatra, the Malay Peninsula and Singapore but which is represented in the Philippines by a special form.

It is fairly certain that many more species of *Calamus* still remain to be discovered in the numerous islands which compose the Philippine archipelago, because there as elsewhere the species seem to be much localized. Three other species, apparently different from those already known but represented by specimens too incomplete to admit of description, have been collected by Dr. Warburg in the Island of Mindanao.

There is, however, now a hope that in a comparatively short time we may have an almost complete knowledge of the Philippine Palms, through the methodical botanical survey of the entire Philippine Flora, already begun by the American Government under the superintendence of Mr. Elmer D. Merrill.

Many of the species of Philippine *Calami* produce valuable canes, but as yet we do not know the purposes for which each is most suited or its corresponding scientific name.

That the species of *Calamus* in the Philippines are probably very numerous is indicated by the fact that some of the species discovered by early collectors, as for example *C. Cumingianus*, *C. manillensis*, and *C. discolor* have not been found again by modern explorers.

XXIII.—Identification of Loureiro's Cochin-China Calami.

Loureiro in his *Flora Cochinchinensis*, of which the first edition made its appearance in the year 1790, gives rather detailed descriptions of six species of *Calamus*. One of these, *C. Scipionum*, is not a native of Cochin-China; this species I have most certainly recognised in numerous complete flowering and fruiting specimens from the Malayan Peninsula and neighbouring countries.

The five Cochin-Chinese species bear the following names:—*C. petraeus*, *C. rudentum*, *C. verus*, *C. amarus* and *C. dioicus*. No authentic specimens of any of these species are known to exist in herbaria, and their identification is therefore always open to doubt, because Loureiro's descriptions, though wonderfully good for their time, are far from sufficient to ensure accuracy of naming in the case of a species of *Calamus*.

I believe that I have recognized *C. dioicus* and also *C. rudentum* in some specimens collected in Cochin-China by Mr. L. Pierre. I cannot say the same of *C. petraeus.* If the description of this species be correct, this cannot be a *Calamus*, as the spadix is said to be terminal and we ought to suspect it to be a *Plectocomia* or a *Korthalsia* rather than a *Calamus;* the citation, however, of Rumph's *Palmijuncus Calapparius* (Herb. Amboin., v, t. 41), adduced by Loureiro, is against this opinion because Rumph's plate represents an easily recognizable *Daemonorops. C. petraeus* therefore still remains an enigma.

Another enigma is *C. verus.* By its short spadix and oblong spathe, and also by the plate cited from Rumph (*Palmijuncus verus* Herb. Amboin., v., t. 54), we might believe that we had to deal with a *Daemonorops* of the section *Piptospatha;* and by its leaflets, which are described as ovate-lanceolate, it would approach *D. didymophyllus.* Probably then *C. verus* is a *Daemonorops* not found again by modern botanists.

C. amarus appears to me to correspond to *C. tenuis* Roxb. (*vide* observations under that species); but as there is not complete evidence of this identification, and as there never can be absolute proof owing to the non-existence of authentic specimens, I have not proposed the adoption of the name *C. amarus* instead of *C. tenuis,* although the former be more ancient than the latter.

XXIV.—Note on Roxburgh's Species of Calamus.

In his *Flora Indica* (iii, p. 773, *et seq.*) Dr. William Roxburgh gives descriptions of the following species of *Calamus* to which I have added when necessary the corresponding correct name:—

Calamus Zalacca Willd. =*Zalacca* sp.
,, *humilis* Roxb. Perhaps the young plant of *C. latifolius.*
,, *erectus* Roxb.
,, *Draco* Willd. =*Daemonorops.*
,, *latifolius* Roxb.
,, *rudentus* Willd. (not *C. rudentum* Lour.) =*C. albus* Pers.
,, *extensus* Roxb. =*Daemonorops Jenkinsianus* Gr.?
,, *quinquenervius* Roxb. =*C. palustris amplissimus* Becc.
,, *Rotang* Willd.
,, *fasciculatus* Roxb. =*C. viminalis fasciculatus* Becc.
,, *tenuius* (*tenuis*) Roxb.
,, *pencillatus* (sic) Roxb. =*C. javensis* Bl.?
,, *gracilis* Roxb.
,, *monoicus* Roxb. =*C. Rotang.*

Of the species proposed as new by Roxburgh, the following species:—*C. erectus C. latifolius, C. gracilis* and *C. tenuis,* have therefore been definitely sustained as additions to science.

Owing to authentic specimens not being now available, the following remain more or less doubtful:—*C. extensus, C. quinquenervius* and *C. pencillatus;* reference may be made to what has been said regarding each of these under the heading of doubtful species.

XXV.—Note on Rumph's species of Calamus and Daemonorops.

Subjoined is a conspectus of the species of *Calamus* and *Daemonorops* figured in the fifth volume of Rumph's *Herbarium Amboinense.*

* PLATE 51. *Palmijuncus Calapparius* = *Daemonorops Calapparius* Bl.
52. " *niger* = *Daemonorops niger* Bl.
* 53. " *albus* = *Calamus albus* Pers.
54-1. " *verus* = A young plant of a species of the group of *Calamus palustris* or perhaps of *C. pisicarpus* ?
54-2. " *verus angustifolius* = *Calamus Rumphii* Bl. (*Daemonorops Rumphii* Mart.)
55-1. " *verus angustifolius* = *Calamus pisicarpus* Bl.
* 55-2A.B. " *viminalis* = *Calamus viminalis* Willd.
56. " *equestris* = *Calamus equestris* Willd.
57-1. " *equestris* = *Calamus Cawa* Bl.
* 58-1. " *Draco* = *Daemonorops Draco* Mart.
58-2. " *Rotang Assam* = *Calamus acidulus* Becc.

The Rotang Assam has been referred by Blume to *C. barbatus*, but to me it appears to be quite distinct not only from this species, but from any other hitherto known. The species distinguished by an asterisk (*) have been definitely recognised. The others represent, I believe, very well-marked species which will be recognised at some future time because, considering the period at which they were made, Rumph's figures are very good and the descriptions, if properly understood, are quite reliable. I have therefore no doubt that these species will be found again in the Moluccas when these islands are better explored.

This belief cannot be certainly entertained regarding the species which are incidentally mentioned or imperfectly described by Rumph. These are as follows:—

Calamus Buroensis Mart.; *C. viminalis* var. *repens* Bl.; *C. graminosus* Bl.; *C. maritimus* Bl.

For information regarding these, reference should be made to the detailed account of them given in the section that deals with doubtful species.

XXVI.—Note on the date of publication of the species of Calamus and Daemonorops named by Martius, Griffith and Blume.

The fact that Martius, Griffith and Blume were at work contemporaneously on the genera *Calamus* and *Daemonorops* has led to great confusion in the synonymy of these genera.

The great work of Martius, "Historia Naturalis Palmarum," and the "Rumphia" of Blume were published in parts at long intervals, and I have not been able in all cases to ascertain the precise date of publication of each part. Moreover, some of the pages of the third volume of the "Historia Naturalis Palmarum," those numbered 179 to 230, were originally printed on paper of a different colour from the rest. These pages were, *after an interval of many years*, reprinted and the reprint substituted for the original. But the reprint of these pages was in reality a new edition—very different from the original, for the author took advantage of their publication to entirely change the text and to make numerous additions.†

In the first edition of these pages (179—230) the generic characters of *Calamus* are given at page 203, and in the pages that follow six species of this genus, of which in all 46 species are recorded, are fully described. The genus *Daemonorops* is entirely omitted in the pages above mentioned, and there is no citation in them of the second volume of Blume's "Rumphia," which bears on the title-page the date 1836. It may be observed with regard to this volume of Blume's work that it contains the figures of several species of *Daemonorops* the descriptions of which appeared many years later in the third volume of the same work. From these data we may conclude that the first edition of pages 179–230 of the "Historia Naturalis Palmarum" was published before 1836, the more so because in these pages there is no reference to the first edition of Blanco's "Flora de Filipinas," which bears the date 1837.

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† With reference to this subject, the note by Martius himself in the *Errata* at the end of vol. iii may be consulted.

There is little or no doubt that the portion of the second volume of "Rumphia," containing plates 171–173, where the species of *Daemonorops*, the descriptions of which first appeared in the third volume, were figured, was not available to the public before the year 1843, although the title-page of the second volume is dated 1836. For this reason I believe that the first edition of pages 179–230 of the "Historia Naturalis Palmarum" should be cited before the plates 71–137, as this first edition in all probability made its appearance in 1836 and the plates in 1843.

In the second edition of pages 179–230 there are descriptions of 13 species of *Daemonorops* and of only six species of *Calamus*. As regards these pages, we might suppose that they were not published later than 1846, because there is no reference in them to Griffith's paper on Indian Palms which appeared in 1845 in the "Calcutta Journal of Natural History." It seems, however, that the true date of these pages is the year 1849, because there is a notice in Hooker's "Journal of Botany," 1, page 221 (1849), in which mention is made of the publication of one of the later parts of Martius' work, containing also 49 pages, belonging to part 7, which were presented to subscribers in substitution of others, the paper of which had changed colour.

That the enumeration of the *Calami* in the third volume of the "Historia Naturalis Palmarum" was completed in the year 1849 was explained by the illustrious author himself in a note appended to page 328 of that volume. It is also stated there that though the Introduction in Volume iii bears the date 1847, the volume was not available to the public before 1849. This circumstance may possibly account for the fact that in the second edition of pages 179–230 of the "Historia Naturalis Palmarum" there is no reference to the text of the third volume of "Rumphia."

The dates of publication of the species of *Calamus* and *Daemonorops*, which are mentioned or described in the works of Martius, Blume and Griffith, so far as I can make out, are as follows:—

1842 ? Martius ; Hist. Nat. Palm, iii, first edition of pp. 179–230.
1843 Blume ; Rumphia ii, pp. 93–173 and pl. 71–137.
1845 Griffith ; Palm. Brit. Ind. in Calcutta Journal of Natural History, v.
1845 ? Blume ; Rumphia, iii, pl. 134–154, without descriptions.
1849 ? Martius : Hist. Nat. Palm. iii, 2nd edition of the pp. 179–230.
1849 Martius ; The enumeration of *Calamus* at the end of vol. iii of the Hist. Nat. Palmarum.
1849 Blume ; Rumphia, iii, with the descriptions of *Calamus*, which bears on the title-page the date 1837.
1850 Griffith ; The Palms of British East India : *op. post.*

XXVII.—On the classification of the species of Calamus.

I must admit that I consider the systematic arrangement of *Calamus* proposed by me to be far from satisfactory; the species are, however, aggregated in groups whose affinities are in most cases real and not artificial.

The order in which the groups succeed each other is not *uniseriate;* that is to say, it must not be supposed that a group is directly derived from the one which precedes it. The whole series of species of *Calamus* in my arrangement lays no claim to represent a true phylogenetic conspectus; indeed, I believe such a classification to be in reality as impossible for the genus *Calamus* as it is for almost any other group of organisms.

I have no belief in the formation of the species of which a genus is composed by a gradual and successive modification from a single primitive archetype. I believe therefore that it would be impossible to compile a complete phylogenetic system of existing organisms even if we could actually examine all the transitory forms of each genus which may have existed, but have now disappeared.

My hypothesis is that in the remote epoch which I have called "Plasmatical," reproduction may have been possible even between two organisms of very diverse nature.* I therefore assume that a few primitive dissimilar types may have been capable of producing fertile offspring, participating in the characters of their parents, and I do not think the manifestation of this phenomenon impossible at that remote epoch, if it be assumed that the power of heredity, or of that force which causes the transmission to their offspring of the universal qualities acquired by their parents, was constantly more active the further back we go in the history of the development of the organic world; while the "plasmatical force," or that which has given to organisms the faculty of assuming new forms or colours more fitted to changed conditions of existence, very powerful in remote geological times, has been constantly less active the more we advance towards the present era. In other words, I suppose that in the remote past fertile hybridism may have occurred between different species of the same genus, between representatives of different genera and, in the very earliest times, even between organisms of a nature so different that now we should consider that they belonged to different families. According to this theory the connecting links between two species would not have been the result of innumerable forms gradually appearing by continuous slight variations, but would be due to the sudden intervention of hybridism.

In my systematic arrangement of the species of *Calamus* I have tried to aggregate the species in groups in accordance with their natural affinities, but I have not been always able to effect my purpose, partly because in some species the affinities are not very clear, partly because our knowledge of some species is defective.

If we attempt to establish the chief divisions of the genus upon the more conspicuous biological characters presented by its constituent species, as for example on whether the leaves are furnished with, or are destitute of, a cirrus; whether the leaf-sheaths are flagelliferous or not; whether the seed has a ruminate or an equable albumen: it very often is found that we are separating widely certain species that in other respects are manifestly closely allied. For instance *C. erectus* is evidently related to *C. Flagellum*, though it has an erect non-scandent stem with non-flagelliferous leaf-sheaths, while *C. Flagellum* is a lofty climber, provided with very long clawed flagella.

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* Beccari: Nelle Foreste di Borneo, p. 300.

Even in the formation of the groups I have found it almost impossible to assign to each division constant and precise characters as it almost always happens that some of the species exhibit aberrant peculiarities.

With reference to the specific value of the new forms proposed by me I may observe that I have followe a middle course, neither differentiating the species excessively nor amalgamating them too boldly. I admit that all of the species I have proposed as new are not of equal value; this, however, is an aim that is impossible of attainment, so many and varied are the natural gradations between specific entities. For example *C. khasianus*, *C. nambariensis* and *C. inermis* are three very closely related species which some botanists might perhaps consider to be different forms of one. They certainly exhibit far fewer differences among themselves than occur for instance between *C. erectus* and *C. Flagellum*. This unequal degree of specific differentiation exists, however, in every generic group of the organic world, and is one of the capital difficulties encountered by the systematic naturalist in dealing with the fauna and flora of every country.

Among the diagnostic characters for the groups it sometimes happens that characters are mentioned of which it is impossible to verify the presence in individual species owing to the incompleteness of the available material; this deficiency, however, is almost always made up for by the correlation of characters, whereby we may, from the parts that are actually before us, deduce the nature of those that are missing. For instance, if we have a spadix which ends in a long robust clawed flagellum, we know for certain that the leaf rachis is not prolonged into a similarly clawed cirrus; if the leaf sheaths be flagelliferous, we know the leaves are not cirriferous and, on the contrary, if the leaves have a distinct clawed prolongation at their apex, the leaf sheaths are not flagelliferous and the spadices in all probability are panicled, comparatively short and broad, and devoid of a long terminal prolongation.

It has not seemed advisable to add to the conspectus of the species an artificial key which would not only have been very difficult to compile but very difficult to employ, owing to the imperfect knowledge that we possess of many of the species and on account of the universal incompleteness of the material usually collected or present in Herbaria.

Moreover, the species of *Calamus* being usually very localized, or found within very limited geographical areas, and the number of species of each region being comparatively limited, a study of the geographical conspectus, with the assistance of the chief subdivisions and their diagnoses, and, above all, of the plates, should I think render the identification of a *Calamus* a matter devoid of serious difficulty.

XXVIII.—Diagnostic characters of the General Calamus and Daemonorops.

There is no precise and easily grasped diagnostic character which enables us to distinguish at once a *Calamus* from a *Daemonorops*. Nevertheless these two genera are so completely distinct by such an assemblage of characters that one is never uncertain as to which of the two a particular Palm belongs.

The leading difference between a *Calamus* and a *Daemonorops* is of a biological character and resides essentially in the function subserved by their spadices or spathes; these organs in fact are so modified as either to be of some assistance to the plant in climbing, or, when this is not the case, the spadices appear to be direct morphological derivates, and the function of assisting the plant to climb is then subserved by the leaf cirri.

In *Daemonorops* the spadices never serve as climbing organs and their spathes, from the very first, are utilized to enclose and protect the flowers, being besides always short in comparison with those of a *Calamus.*

In *Calamus* the spathes, even in spadices that are not cirriferous at their summits and that are comparatively short, are elongate and persistent, at least in their basal part which is always tubular; they are also, like the spiral part of the spadix, more or less armed with hooked prickles—the kind of spines that aid the plant to climb. If, as sometimes happens, the spathes of *Calamus* are not tubular but are open, flat, and laminar, the axis of the spadix is nevertheless elongate and more or less armed with claws, at least at its apex.

In *Daemonorops* all the spathes, with the exception in some cases of the basilar one, are deciduous, usually broad and open thoughout their entire ventral aspect and, more especially, are never armed with hooked prickles; they have therefore no organs at all to assist the plant in climbing; moreover, the axis of the spadix, which is usually short, never bears claws and never shows any tendency to become flagelliform.

Among the species of *Calamus* I know only *C. hypoleucus*, a very anomalous Palm, which has short spadices and broad cymbiform unarmed spathes, a good deal resembling those of a *Daemonorops. C. Lobbianus*, *C. conirostris* and *C. brachystachys* have also spathes somewhat resembling those of a *Daemonorops*, but in these species, which also form a group standing alone in the genus, the structure of the spikelets and flowers is that of true *Calami.* In fact, the spikelets of *Calamus*, especially the female ones, are somewhat different from those of *Daemonorops;* in these the spathels are less developed and generally are reduced to a mere scale or to a short membranous ring, and the involucrophore is elongate and stout so that usually the fruit of a *Daemonorops* appears distincly stalked. Moreover, female flowers of *Calamus* are distinguishable at a glance from those of *Daemonorops:* in the former genus they have the calyx distinctly 3-toothed or 3-lobed and the corolla hardly longer than the calyx: in the latter, as a general rule, the calyx is almost truncate at the mouth and the corolla is conspicuously longer than the calyx.

The fruit in the two genera is very similar, but a fruit with a seed in which the albumen is homogeneous can never be that of *Daemonorops*, though there are not a few *Calami* with a ruminated seed such as, without a single exception, we find in *Daemonorops.*

No *Daemonorops* ever bears leaf sheath flagella, nor are its leaves paripinnate towards the apex, which is always cirriferous.

Therefore a climbing Palm which has flagelliferous leaf sheaths, flagelliferous spadices, leave paripinnate to the apex, homogeneous seeds and tubular spathes never can be a *Daemonorops*. With this *ensemble* of characters we can always succeed in distinguishing a *Calamus* from a *Daemonorops* and in most cases we can do this even if the specimens are in a sterile condition, at any rate if they belong to an adult plant.

XXIX.—*Calamus or Palmijuncus?*

Dr. Otto Kuntze in his "Revisio Generum Plantarum," p. 173, believes that the name *Calamus* Linn. must give way to that of *Palmijuncus* Rumph; accordingly all the species of *Calamus* known to the illustrious author are registered in pages 731–734 of the above quoted work under the generic name of *Palmijuncus*. As the adoption of the latter name involves a vexed question of nomenclature regarding which I am unwilling to express an opinion, I have left matters as they have long stood. I have only to remark that the substitution of the name of *Palmijuncus* for the name *Calamus* does not help to simplify the already very intricate synonymy under *Calamus*.

I have therefore continued to use the generic name. *Calamus*, thinking that it will be a quite easy and at the same time a not unpleasant task for some one who may take delight in adding his own name to new species, to change into *Palmijunci* all those placed by me under the genus *Calamus*.

With regard to this subject, however, I have to point out that the genus *Palmijuncus*, as understood by Dr. O. Kuntze, includes both *Calamus* and *Daemonorops*, two genera which I consider it convenient to keep separate. As Dr. O. Kuntze appears to have taken as the type of the genus *Palmijuncus* the first species published by Rumph in the "Herbarium" under that genus, and as the species in question is *Palmijuncus Calapparius*, which is a typical *Daemonorops*, the generic name *Palmijuncus*, if resuscitated at all, ought to correspond to the name *Daemonorops*, and not to the name *Calamus*.

XXX.—*Geographical Distribution.*

More than 200 species of true *Calamus* are at present known; these without a single exception are natives of the Old World. Their chief home is in the primeval hot and humid forests of tropical and subtropical Asia, and of the Asiatic Archipelagos; a few only are African and Australian.

The regions of the world where *Calami* are most abundant are:—the Malayan Peninsula, with 31 species; Borneo, with 30 species; Burma, with 24 species; Siam, Cochin-China and Lower China, with 18 species; New Guinea, with 18 species; the Philippines, with 17 species; Java, with 14 species; Southern India, with 12 species; Ceylon, with 11 species; Sumatra, with 10 species. After these, arranged in accordance with the number of species that they possess, come Tropical Africa, Celebes, the Moluccas, the Sikkim Himalaya, the Assam Hills, Eastern Bengal, Australia.

The five or six known Australian species are chiefly confined to the coast of Queensland and only one, *C. Muellerii*, extends further south, to the northern part of the coast of New South Wales, where it has been found on the Clarence River at about Lat. 29° 30′ S. This is in fact the most southern representative of the genus and is the only one that grows outside the tropics in the Southern Hemisphere.

In the Northern Hemisphere no species of *Calamus* extends north of Lat. 30° N. *C. tenuis*, which is one of the most western of the Asiatic species is also the one that extends furthest north, its extreme limit being Kumaon in the Western Himalaya. In Eastern Asia the most northern point is attained by *C. formosanus*, which has been collected at Kalung in North Formosa, in Lat. 29° 30′ N., but it is possible that some other species of *Calamus* may occur further to the north and east in the Japanese Archipelago of Liu-kiu, for I have seen, in the Leiden Herbarium, some fruits of a *Daemonorops* labelled "Japonia, van Siebold." We may therefore expect that one or more species of *Calamus* also occur there.

An unnamed *Calamus*, apparently allied to *C. Moseleyanus*, has been discovered by H. N. Moseley in the Admiralty Islands; this and *C. vitiensis*, which has been found in the Island of Taviuni, Long. 180° E., in the Fiji group, are the only species of *Calamus* as yet known to occur to the east of New Guinea. *C. vitiensis* is undoubtedly the most eastern species of the genus and is the only one that occurs in the remote Pacific Islands.

We know of eight species from Tropical Africa. Their area of distribution ranges from the mouths of the rivers Senegal and Gambia to the White Nile where a species, *C. Schweinfurthii*, has been discovered by Dr. Schweinfurth near the equator in the Niam-Niam and Monbuttu country. The other known African species have their home on the coasts of the Gulf of Guinea north of the Equator. So far no *Calami* have been recorded from the very large and botanically unexplored region which lies between the mouth of the Niger and the home of *C. Schweinfurthii*. It is almost impossible to believe that there are no representatives of the genus in this wide tract, extending as it does over 29 degrees of longitude.

The African *Calami* do not differ strikingly from some of the Asiatic species of the flagelliferous and non-cirriferous groups, and form a distinct group of closely related species, very difficult to distinguish from each other.

Summing up our knowledge of the general geographical distribution of the species of *Calamus* we may say that this genus occupies the very large tropical and sub-tropical area in the Old World which ranges in latitude from 30° N. to 30° S. and in longitude from 17° W. to 180° E., or a good deal more than half the circumference of the globe.

Generally speaking, nearly all the species of *Calamus* have a very limited geographical distribution. Each botanical region and sub-region has numerous species peculiar to itself and there are extremely few species that occupy a very wide area. The few that are at all widespread, such as *C. viminalis* and *C. palustris*, affect the frequently flooded forests of low-lying lands near the sea. *C. palustris*, with its numerous varieties, extends from the mouths of the Ganges to Cochin-China, and appears to be the species from which have originated others endemic in the southern islands of the Philippines and in the Moluccas. *C. ornatus* is also represented by distinct varieties in the maritime regions of Java, Sumatra, the Malay Peninsula, Borneo and the Philippines; this species is perhaps indebted for its wide area to the dispersal of its fleshy fruits by birds. Of the inland species *C. tenuis* is the one most frequently met with; it extends right across Northern India from Kumaon eastward to Burma, and occurs also in Cochin-China.

I have already remarked that each region possesses species peculiar to itself, but the main head-quarters of endemic *Calami* are evidently the Malayan Peninsula, Borneo, Littoral Burma, the Philippines and New Guinea; among these centres perhaps Borneo and the Malayan Peninsula hold the leading places. Java possesses various species in common with Sumatra, but some uncertainty exists as regards the exact habitat of several of the Javan and Sumatran species, owing to the fact that some confusion and admixture appear to have taken place among the specimens preserved in Dutch herbaria, and gathered by early collectors in these countries. I imagine besides that many *Calami* still remain to be collected in Sumatra, especially in the basins of the large rivers that reach its east coast.

As an instance of the great localisation of *Calami* I may mention Borneo, where, out of the 30 species known to occur, only five grow also in the Malayan Peninsula, in spite of the similarity of the two floras. Nor are these five absolutely identical; they are represented by geographical varieties.

All the species known to occur in Celebes, the Moluccas, and New Guinea are also endemic within their respective areas.

As has already been said, the number of species of *Calamus* at present known to exist, exceeds 200. Possibly, however, this number only represents about two-thirds of the species that actually exist, a very large tract of forest-land in the Malayan Peninsula, New Guinea, Borneo, Sumatra, the Philippines, Burma, Siam, Cochin-China, Equatorial Africa, North Australia, etc., being still botanically unexplored.

The Rotangs or Palm Lianes, including in this category, besides *Calamus*, the other scandent *Lepidocaryeæ*, such as *Daemonorops*, *Korthalsia*, *Plectocomia*, &c., form one of the striking features of the virgin tropical forests of the Old World. In America climbing palms, though represented by several species of *Desmoncus*, are far less abundant than in Asia and Indonesia.

The Rotangs are never gregarious, but always grow isolated in the forest, and none of the species are ever so abundant as to give a special character to the forest vegetation. In certain localities, however, especially in deep valleys where the soil is rich in humus at the foot of the mountains, several species of *Calamus* may often be found growing in company within a very limited area, and I recollect having collected about 20 species of Palm Lianes (*Calamus* and *Daemonorops*) in a narrow valley at the base of Mount Mattang in Borneo.

The graceful fronds of *Calami* may often be seen arching downward from trees and rocks along the banks of rivers, but generally Palms of this kind prefer the deep shade of the primitive forest of the plains and of the slopes of the mountains, some times reaching their tops when these do not exceed 1,500–1,800 metres in elevation.

Rotangs are never to be met with in the secondary forest, or in that which grows up after the primary forest has been destroyed. *C. salicifolius* and *C. tonkinensis*, two Cochin-Chinese species, are perhaps an exception to this rule, for they apparently grow in open situations and consequently have less of a forestal character than other *Calami*; they are not scandent but bushy, and their leaves are of firm texture and have a glaucous appearance.

A few non-scandent species of Calamus form part of the undergrowth of the great forests, along with several other Palms. Among these may be enumerated *C. castaneus*, *C. Griffithianus*, *C. bacularis*, *C. Lobbianus*, *C. Burckianus*, *C. perakensis*, *C. ramosissimus* and probably a few others.

In Java the species that reach a considerable altitude on the mountains are *C. javensis*, *C. heteroideus* and *C. adspersus*; the last mentioned has been gathered by Zollinger on Mount Semiru at an elevation of about 1800 metres. In Sumatra I have obtained *C. opacus* at 1700 metres on Mount Singalang. In Borneo and in the Philippines a few species of *Calamus* have been found growing up to an elevation of 1900 metres, and in New Guinea *C. Cuthbertsonii* occurs at an elevation of 2500 metres.

The species which exhibits what is perhaps the greatest altitudinal range is *C. javensis*, for it extends from the level of the sea to the tops of mountains of moderate height in Java, Borneo and the Malayan Peninsula, where however it assumes peculiar and very slender forms.

I have not found *Calami* so frequent in New Guinea as in Borneo: still, the total number of species known from that island is considerable. It seems that a few representatives of this genus occur more or less scattered over the whole Papuan region, and as the species there appear strictly localized in small areas, it is probable that, when the flora of the island is thoroughly explored, the number present in New Guinea will be found not to be smaller than the number present in Borneo.

In India several species of *Calamus* contribute to the luxuriant vegetation of the forest-clad sub-Himalayan slopes of Nepal, Sikkim and Bhutan. *C. Flagellum* has been collected at 1370 metres and *C. acanthospathus* at 1800 metres in Sikkim; this is the highest altitude that I find recorded as attained by a *Calamus* in the Himalaya.

The same altitude of 1800 metres is reached by *C. Huegelianus* and 1900 metres is reached by *C. Brandisii* in the Nilgiri mountains in Southern India.

In the most completely explored forests of the districts of Perak and Malacca in the Malayan Peninsula, several species of *Calamus*, such as *C. Diepenhorstii*, *C. javensis*, *C. bubuensis*, *C. exilis*, *C. luridus*, etc., have been found growing on Gunong Tamban Batak, Gunong Bubu, Mount Ophir, on the Taiping hills, etc., at elevations of from 1,000 to 1,900 metres.

As regards the geographical distribution of the *Calami*, taking into consideration only those species that occur within the boundaries of the British Indian Empire, I have to observe that the *Calami* found on the southern slopes of the Himalaya, following the Burmese "littoral" from Chittagong to Pegu and Tenasserim, pass into the Malayan Peninsula, which is the chief head-quarters of endemic species.

In the Indian Peninsula the head-quarters of the genus lie in its most southern extremity. The Indian species so far known number 83 or about 40 per cent. of all known species; of these 71 are endemic and 12 extend to other countries. As already stated, the Indian region that is the richest in *Calami* is the Malayan Peninsula, which possesses 31 species, or 40 per cent. of those belonging to the Indian flora and 16·5 per cent. of the known species of the genus. Of the 31 only one species, *C. palustris*, has been found north of the Isthmus of Krau, and 23 are endemic.

In Northern India the two principal head-quarters of *Calami* are Sikkim and Assam. The following are the species grownig in Sikkim:—*C. erectus*, *C. schizospathus*, *C. Flagellum*, *C. leptospadix*, *C. acanthospathus*, *C. latifolius*, *C. latifolius marmoratus*, *C. inermis*; the following are those of Assam:—*C. erectus*, *C. leptospadix*, *C. floribundus*, *C. Kingianus*, *C. viminalis*, *C. tennis*, *C. Garuba*, *C. gracilis*, *C. khasianus*, *C. nambariensis*.

Burma is rich in *Calami*, especially in its littoral regions. Tenasserim and the Mergui Archipelago, though botanically very little known, have supplied very peculiar forms, many of which belong to the group with long open flat spathes, such as *C. platyspathus*, *C. nitidus*, etc. Especially characteristic of the littoral regions of Burma are *C. hypoleucus*, *C. leucotes* and *C. myrianthus* which have their leaflets coated on their lower surface with a more or less white pulverulent or chalky indumentum.

Of the 9 species growing in the Andaman and Nicobar Islands, *C. longisetus* is also found in Burma, *C. viminalis* and *C. palustris* are widespread species, and *C. unifarius Pentoni* is a curious geographical form of a Javanese species. The others are endemic, but of these *C. pseudo-rivalis*, *C. Helferianus* and *C. andamanicus* appear somewhat allied to certain Ceylon species.

One of the principal conditions of existence for *Calami* being an abundant humidity of atmosphere, they are absent from the dry and hot regions of the Indus and Upper Gangetic Plains, and from the Central Provinces.

Southern India, including Sir J. D. Hooker's provinces of Malabar and the Deccan, has 12 species: of these *C. Rotang* is found also in Ceylon unmodified three others also occur in Ceylon, but are represented on the continent by varieties of geographical species—*C. Thwaitesii* VAR. *canaranus*, *C. pseudo-tenuis*, *C. Metzianus*—(= *C. rivalis* ?); the remainder are endemic.

Ceylon has 11 species, of which 7 are endemic and 4 are represented by varieties or reappear unchanged on the Continent. The South Indian and Ceylon *Calami* taken as a whole are nowhere to be found north of Lat. 17° N.

Of the Ceylon *Calami*, *C. delicatulus* appears allied to *C. nicobaricus* and *C. Helferianus*, *C. rivalis* to *C. pseudo-rivalis*, and *C. ovoideus* to *C. andamanicus*.

The Indian non-endemic species of *Calamus*, not including the Malayan Peninsular, are as follows:—*C. viminalis*, *C. tenuis*, *C. palustris*, *C. unifarius*. If the Malayan Peninsular species be added to the four just enumerated, we have the following non-endemic:—*C. javensis*, *C. paspalanthus*, *C. Diepenhorstii*, *C. ornatus*, *C. Scipionum*, *C. viridispinus*, *C. caesius*, *C. Oxleyanus*.

Of these non-endemic species of the Malayan Peninsula, we find in Java *C. viminalis*, *C. javensis*, *C. ornatus*; in Sumatra *C. Diepenhorstii*, *C. ornatus*, *C. Scipionum*, *C. viridispinus*; finally in Borneo *C. javensis*, *C. paspalanthus*, *C. Diepenhorstii*, *C. ornatus*, *C. Scipionum*, *C. caesius*.

The Indian *Calami* that have the widest geographical distribution are *C. tenuis*, *C. viminalis*, *C. palustris*.

The following is a summary of the geographical distribution of the species of *Calamus* in India, according to the botanical provinces proposed y Sir J. D. Hooker in his "Sketch of the Flora of British India":—

	Province.	Specie.
I.	Eastern Himalaya	6
II.	Western Himalaya	1
III.	Indus Plain	...
IV.	(*a*) Upper Gangetic Plain	...
	(*b*) Bengal and Sundrabans	5
V, VI.	Malabar and Deccan	12
VII.	Ceylon	11
VIII.	Burma	22
IX.	Malay Peninsula	31

Geographical distribution of the

WESTERN HIMALAYA.	EASTERN HIMALAYA.	LOWER BENGAL.	BURMA.			MALAYAN	
			North Burma (Assam, *e.g.*).	Central Burma.	South Burma (Tenasserim, *e.g.*).	Continent.	Penang.
C. tenuis ...	C. erectus, v. schizospathus.	C. viminalis.	C. erectus.	C. erectus v. birmanicus.	C. viminalis.	C. castaneus.	C. javensis v. pinangianus.
	,, Flagellum.	,, tenuis.	,, Flagellum.	,, Flagellum v. karinensis.	,, concinnus.	,, Griffithianus.	,, viminalis v. pinangianus.
	,, leptospadix.	,, Guruba.	,, leptospadix,	,, arborescens.	,, Helferianus.*	,, radulosus.	,, Diepenhorstii.
	,, acanthospathus.	,, palustris v. amplissimus.	,, "floribundus." v. depauperatus.	,, longisetus.	,, Feanus.	,, rugosus.	,, Martianus.
	,, latifolius.	,, latifolius.	,, Kingianus.	,, viminalis.	,, Guruba.	,, javensis (peninsularis), ,, v. purpurascens, ,, v. tenuissimus, ,, v. polyphyllus, ,, v. intermedius.	
	,, latifoliu v. marmoratus.		,, viminalis.	,, tenuis.	,, nitidus.		
	, inermis.		,, tenuis.	,, Guruba.	,, platyspathus.		
			,, acanthospathus.	,, hypoleucus.	,, myrianthus.		
			,, Guruba.	,, leucotes.	,, melanacanthus.	,, filipendulus.	
			,, gracilis.	,, palustris.	,, palustris.	,, luridus.	
			,, khasianus.	,, Doriaei.		,, perakensis.	
			,, nambariensis.	,, polydesmus.		,, ramosissimus.	
						,, paspalanthus v. peninsularis.	
						,, Diepenhorstii.	
						,, exilis.	
						,, tomentosus v. Korthalsiaefolius. ,, v. intermedius.	
						,, spathulatus. ,, v. robustus.	
						,, insignis.	
						,, ornatus v. horridus.	
						,, Scipionum.	
						,, densiflorus.	
						,, aquatilis.	
						,, palustris v. malaccensis.	
						,, axillaris.	
						,, neglectus.	
						,, bubuensis.	
						,, viridispinus,	
						,, caesius.	
						,, simplex.	
						,, giganteus.	
						,, pallidulus;	
						,, Oxleyanus.	
						,, conirostris.	
						,, Lobbianus.	

N.B.—The habitat of the species marked with an asterisk is somewhat uncertain.

Indian species of Calamus.

PENINSULA.				SOUTHERN INDIA.		
Singapore.	ANDAMANS.	NICOBARS.	CEYLON.	Malabar Coast.	Nilgiri.	Coromandel Coast.
C. luridus.	C. longisetus.	C. dilaceratus.	C. Thwaitesii.	C. Thwaitesii v. canaranus.	C. pseudo-tenuis.	C. viminalis v. bengalensis.
,, Diepenhorstii v. singaporensis.	,, viminalis v. andamanicus.	,, pseudo-rivalis.	,, pachystemonus.	,, Metzianus.	,, Delessertianus.*	,, pseudo-tenuis.
,, Ridleyanus.	,, Helferianus.*	,, nicobaricus.	,, digitatus.	,, pseudo-tenuis.	,, Brandisii.	,, Hookerianus.
,, ornatus v. horridus.	,, andamanicus.	,, andamanicus.	,, radiatus.	,, travancoricus.	,, Huegelianus.	,, Rotang.
,, aquatilis.	,, palustris.	,, palustris.	,, rivalis.	,, Rheedei.	,, Gamblei.	
,, pallidulus.		,, unifarius. *var.* Pentong.	,, pseudo-tenuis.		,, v. sphaerocarpus.	
,, Oxleyanus.			,, delicatulus.			
,, Lobbianus.			,, Rotang.			
			,, zeylanicus.			
			,, ovoideus.			
			,, polystachys.*			

Prospectus of the species of Calamus in each of the

JAVA.	SUMATRA.	BORNEO.	CELEBES.	MOLUCCAS.	NEW GUINEA.
C. Burckianus.	C. schistoacanthus.	C. ruvidus.	C. symphysipus.	C. Cawa.	C. Papuanus.
,, javensis.	,, opacus.	,, muricatus.	,, kandariensis.	,, equestris.	,, interruptus.
,, ,, v. exilis.	,, Diepenhorstii.	,, zonatus.	,, plicatus.	,, Rumphii.	,, ,, v. docilis.
,, viminalis.	,, ciliaris.	,, flabellatus.	,, Minahassae.	,, albus.	,, zebrinus.
,, Reinwardtii.	,, rhomboideus v. uberrimus.	,, javensis v. tetrastichus.	,, Zollingerii.	,, pisicarpus.	,, serrulatus.
,, heteroideus.	,, spectabilis v. sumatranus.	,, ,, v. sublevis.	,, macrosphaerion.	*Sp.* 5.	,, barbatus.
,, ,, v. depauperatus.	,, ornatus v. sumatranus.	,, ,, v. acicularis.	,, pachystachys.		,, vestitus.
,, ,, v. pallens.	,, Scipionum.	,, filiformis.	,, didymocarpus.		,, ralumensis.
,, horrens.	,, viridispinus v. sumatranus.	,, corrugatus.	,, acidus.		,, macrochlamys.
,, ciliaris.	,, Manan.	,, gonospermus.	*Sp.* 9.		,, gogolensis.
,, rhomboideus.	*Sp.* 10.	,, schistoacanthus.*			,, heteracanthus.
,, spectabilis.		,, nematospadix.			,, Cuthbertsonii.
,, adspersus.		,, sabensis.			,, Warburgii.
,, ornatus javanicus.		,, myriacanthus.			,, aruensis.
,, asperrimus.		,, pygmaeus.			,, Hollrungii.
,, unifarius.		,, bacularis.			,, Lauterbachii.
,, melanoloma.		,, paspalanthus.			,, fertilis.
Sp. 14.		,, marginatus.			,, Macgregorii.
		,, hispidulus.			,, Hartmannii.
		,, pilosellus.			*Sp.* 18.
		,, sarawakensis.			
		,, Blumei.			
		,, ornatus v. mitis.			
		,, Scipionum.			
		,, mucronatus.			
		,, erioacanthus.			
		,, optimus.			
		,, caesius.			
		,, mattanensis.			
		,, subinermis.			
		,, brachystachys.			
		,, ferrugineus.			
		Sp. 30.			

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* The habitat of Borneo for this Sumatran species is very uncertain.

principal partial extra Indian Floras.

PHILIPPINES.	SIAM, COCHIN-CHINA AND CHINA.	MINOR SUNDA ISLANDS.	AUSTRALIA.	AFRICA.
C. mollis. ,, v. major.	C. dongnaiensis.	C. scabridulus.	C. Muellerii.	C. deerratus.
,, Meyenianus.	,, rudentum.	,, Scipionum.	,, caryotoides.	,, Barterii.
,, Blancoi.	,, dicicus.	,, Manan.	,, australis.	,, Heudelotii.
,, Cumingianus.	,, viminalis cochinchinensis.	,, Oxleyanus.	,, Moti.	,, falabensis.
,, ornatus v. philippinensis.	,, siamensis.	*Sp.* 4.	,, radicalis.	,, Leprieurii.
,, Merrillii.	,, tenuis.		*Sp.* 5.	,, Perrotte
,, Moseleyanus.	,, Godefroyii.			,, akimensis.
,, spinifolius.	,, Faberii.			,, Schweinfurthii.
,, trispermus.	,, tonkinensis.			*Sp.* 8.
,, manillensis.	,, salicifolius. ,, ,, v. leiophyllus.			
,, microsphaerion.	,, tetradactylus.			
,, ramulosus.	,, Bousigonii.			
,, Vidalianus.	,, formosanus.			
,, siphonospathus. ,, ,, v. farinosus. ,, ,, v. sublevis. ,, ,, v. oligolepis major. ,, ,, v. oligolepis minor. ,, ,, v. polylepis.	,, palustris v. cochinchinensis.			
,, microcarpus.	,, platyacanthus.			
,, dimorphacanthus.	,, Henryanus.			
,, discolor.	,, thysanolepis.			
Sp. 17.	,, Kunzeanus.			
	Sp. 18.			

General distribution of the species of Calamus.

		Ceylon.	South India.	North India.	Burma.	Andamans and Nicobars.	Malayan Peninsula.	Siam.	Cochin-China.	China.	Philippines.	Borneo.	Sumatra.	Java.	Minor Sunda Islands.	Celebes.	Moluccas.	Dutch New Guinea.	German New Guinea.	British New Guinea.	Aru Islands.	Australia.	Fiji Islands.	Tropical Africa.
	CALAMUS.																							
1	erectus *Roxb.*	...	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. schizospathus (*Gr.*) *Becc.*	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. birmanicus *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	Flagellum *Griff.*	...	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. karinensis *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	arborescens *Griff.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	dongnaiensis *Pierre*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	longisetus *Griff.*	...	...	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	Thwaitesii *Becc.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. canaranus *Becc.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	rudentum *Lour.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	octospadix *Griff.*	...	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9	dilaceratus *Becc.*	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	castaneus *Griff.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	Griffithianus *Mart.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	Burckianus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
13	deerratus *Mann. & Wendl.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
14	Barterii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
15	Heudelotii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
16	falabensis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
17	Leprieurii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
18	Perrottetii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
19	akimensis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
20	Schweinfurthii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+
21	pachystemonus *Thw.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22	digitatus *Becc.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	radiatus *Thw.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	ruvidus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
25	scabridulus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...
26	muricatus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
27	zonatus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
28	radulosus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	rugosus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30	flabellatus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
31	javensis *Bl.* (insularis)	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	subv. exilis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	,, v. peninsularis *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	subv. purpurascens *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, pinangianus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. tetrastichus *Bl.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. tenuissimus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. sublevis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. polyphyllus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. intermedius *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(species ?)	,, v. acicularis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
(?) 32	filiformis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
33	corrugatus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...

		Ceylon.	South India.	North India.	Burma.	Andamans and Nicobars.	Malayan Peninsula.	Siam.	Cochin-China.	China.	Philippines.	Borneo.	Sumatra.	Java.	Minor Sunda Islands.	Celebes.	Moluccas.	Dutch New Guinea.	German New Guinea.	British New Guinea.	Aru Islands.	Australia.	Fiji Islands.	Tropical Africa.
	CALAMUS—*continued.*																							
34	papuanus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
35	filipendulus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
36	gonospermus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
	floribundus *Griff.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. depauperatus *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	interruptus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
	,, v. docilis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
39	dioicus *Lour.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	schistoacanthus *Bl.*	...	...	...	...	...	...	...	...	...	...	? +	+	...	...	...	...	...	...	...	...	...	...	...
41	Kingianus *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	Muellerii *H. Wendl.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...
43	caryotoides *All. Cunn.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...
44	viminalis *Willd.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	,, v. fasciculatus (*Roxb.*) *Becc.* subv. bengalensis *Becc.*	...	+	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	subv. andamanicus *Becc.*	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	subv. pinangianus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	subv. cochin-chinensis *Becc.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45	siamensis *Becc.*	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
46	concinnus *Mart.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
47	mollis *Blanco*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. major *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
(?) 48	Meyenianus *Schauer*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
(?) 49	Blancoi *Kunth*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
50	rivalis *Thw.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(?) 51	Metzianus *Schlecht.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
52	pseudo-rivalis *Becc.*	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
53	pseudo-tenuis *Becc.*	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
54	Hookerianus *Becc.*	...	+?	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
55	nematospadix *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
56	australis *Mart.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...
(?) 57	Moti *Bailey*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...
58	radicalis *H. Wendl.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...
59	zebrinus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
60	serrulatus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
61	Reinwardtii *Mart.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
62	heteroideus *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	,, v. depauperatus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	,, v. pallens (*Bl.*) *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
63	opacus *Bl.*	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...
64	luridus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
65	sabensis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
66	delicatulus *Thw.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
67	Helferianus *Kurz*	...	...	...	+?	+?	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
68	nicobaricus *Becc.*	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

		Ceylon.	South India.	North India.	Burma.	Andamans and Nicobars.	Malayan Peninsula.	Siam.	Cochin China.	China.	Philippines.	Borneo.	Sumatra.	Java.	Minor Sunda Islands.	Celebes.	Moluccas.	Dutch New Guinea.	German New Guinea.	British New Guinea.	Aru Islands.	Australia.	Fiji Islands.	Tropical Africa.
	CALAMUS—*continued.*																							
69	myriacanthus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
70	pygmaeus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
71	barbatus *Zipp.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
72	vestitus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
73	ralumensis *Warb.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
74	macrochlamys *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
75	gogolensis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
76	tenuis *Roxb.*	...	...	+	+	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
77	horrens *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
78	Godefroyi *Becc.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
79	Rotang *L.*	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
80	Walkerii *Hance*	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...
81	Faberii *Becc.*	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...
82	tonkinensis *Becc.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
83	Delessertianus *Becc.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
84	Brandisii *Becc.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
85	salicifolius *Becc.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	„ v. leiophyllus *Becc.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
86	tetradactylus *Hance*	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...
87	acanthospathus *Griff.*	...	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
88	Feanus *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
89	bacularis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
90	perakensis *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
91	ramosissimus *Griff.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
92	paspalanthus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
	„ v. peninsularis *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
93	Guruba *Ham.*	...	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
94	nitidus *Mart.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
95	platyspathus *Mart.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
96	myrianthus *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
97	hypoleucus (*Kurz*) *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
98	leucotes *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
99	travancoricus *Bedd.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
100	Rheedei *Griff.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
101	Huegelianus *Mart.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
102	Gamblei *Becc.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	„ v. sphaerocarpus *Becc.*	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
103	gracilis *Roxb.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
104	melanacanthus *Mart.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
105	Diepenhorstii *Miq.*	...	...	...	...	...	+	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...
	„ v. singaporensis *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
106	marginatus *Mart.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
107	ciliaris *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
108	exilis *Griff.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
109	hispidulus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
110	pilosellus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
111	sarawakensis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
112	rhomboideus *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	„ v. uberri s *Miq.*	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...

		Ceylon.	South India.	North India.	Burma.	Andamans and Nicobars.	Malayan Peninsula.	Siam.	Cochin China.	China.	Philippines.	Borneo.	Sumatra.	Java.	Minor Sunda Islands.	Celebes.	Moluccas.	Dutch New Guinea.	German New Guinea.	British New Guinea.	Aru Islands.	Australia.	Fiji Islands.	Tropical Africa.
	CALAMUS—*continued*.																							
113	tomentosus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. korthalsiaefolius *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. intermedius *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
114	Blumei *Becc.*	...	...	...	...	...	...	...	...	...	...	+?	...	...	...	...	...	...	...	...	...	...	...	...
115	spectabilis *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	,, v. sumatranus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...
116	Bousigonii *Pierre*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
117	heteracanthus *Zipp.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...
118	symphysipus *Mart.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
119	Cumingianus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
120	vitiensis *Warb.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...
121	kandariensis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
122	adspersus *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
123	plicatus *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
124	Minahassae *Warb.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
125	Cawa *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...
126	equestris *Willd.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...
127	Cuthbertsonii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...
128	spathulatus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. robustus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
129	Martianus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
130	insignis *Griff.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
131	ornatus *Bl.* (javanicus)	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	,, v. horridus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. sumatranus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...
	,, v. mitis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. philippinensis *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
132	Scipionum *Lour.*	...	...	...	...	...	+	...	...	...	...	+	+	...	+	...	...	...	...	...	...	...	...	...
133	densiflorus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
134	Ridleyanus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
135	zeylanicus *Becc.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
136	ovoideus *Thw.*	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
137	polystachys *Becc.*	+?	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
138	andamanicus *Kurz*	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
139	Zollingerii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
140	Merrillii *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
141	aquatilis *Ridley*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
142	Warburgii *K. Schum.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
143	Moseleyanus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
144	formosanus *Becc.*	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...
145	Rumphii *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...
(?)146	palustris *Griff.*	...	...	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. amplissimus *Becc.*	...	...	+?	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. malaccensis *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. cochin-chinensis *Becc.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
147	latifolius *Roxb.*	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. marmoratus *Becc.*	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
148	spinifolius *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
149	trispermus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
150	manillensis *H. Wendl.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...

		Ceylon.	South India.	North India.	Burma.	Andamans and Nicobars.	Malayan Peninsula.	Siam.	Cochin-China.	China.	Phillippines.	Borneo.	Sumatra.	Java.	Minor Sunda Islands.	Celebes.	Moluccas.	Dutch New Guinea.	German New Guinea.	British New Guinea.	Aru Islands.	Australia.	Fiji Islands.	Tropical Africa.
	CALAMUS—*continued.*																							
151	axillaris *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
152	neglectus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
153	bubuensis *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
154	viridispinus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. sumatranus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...
155	mucronatus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
156	asperrimus *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
157	erioacanthus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
158	optimus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
159	caesius *Bl.*	...	...	...	...	...	+	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
160	simplex *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
161	Doriaei *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
162	polydesmus *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
163	khasianus *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
164	nambariensis *Becc.*	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
165	inermis *T. And.*	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
166	Manan *Miq.*	...	...	...	...	...	...	...	...	...	...	...	+	...	+	...	...	...	...	...	...	...	...	...
167	giganteus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
168	platyacanthus *Warb.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
169	albus *Pers.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...
170	pallidulus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
171	macrosphaerion *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
172	mattanensis *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
173	Oxleyanus *Teysm. & Binn.*	...	...	...	...	...	+	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...
174	microsphaerion *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
175	ramulosus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
176	unifarius *H. Wendl.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
	,, v. Pentong *Becc.*	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
177	subinermis *H. Wendl.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
178	pisicarpus *Bl.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...
179	aruensis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...
180	Hollrungii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
181	Vidalianus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
182	pachystachys *Warb.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
183	didymocarpus *Warb.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
184	melanoloma *Mart.*	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...
185	siphonospathus *Mart.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. sublevis *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. farinosus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. oligolepis major *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. oligolepis minor *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
	,, v. polylepis *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
186	microcarpus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
187	dimorphacanthus *Becc.*	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...
188	conirostris *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
189	Lobbianus *Becc.*	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
190	brachystachys *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...
191	Henryanus *Becc.*	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...
192	thysanolepis *Hance*	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...
193	ferrugineus *Becc.*	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...

		Ceylon.	South India.	North India.	Burma.	Andamans and Nicobars.	Malayan Peninsula.	Siam.	Cochin-China.	China.	Philippines.	Borneo.	Sumatra.	Java.	Minor Sunda Islands.	Celebes.	Moluccas.	Dutch New Guinea.	German New Guinea.	British New Guinea.	Aru Islands.	Australia.	Fiji Islands.	Tropical Africa.
	CALAMUS—*concluded.*																							
194	Kunzeanus *Becc.*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
195	Lauterbachii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
196	fertilis *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
197	Macgregorii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
198	Hartmannii *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...
199	discolor *Mart.*	...	...	...	...	...	...	...	...	...	+ ?	...	...	...	...	...	...	...	...	...	...	...	...	...
200	acidus *Becc.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
201	Harmandi *Pierre*	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

CALAMUS LINN.

Linn. Gen. Plant. edit. 1764, 173, No. 436; Mart. Hist. Nat. Palm. iii, 207 (2nd edit.); Miq. Fl. Ind. Bat. iii, 103; Hook. f. & Becc. in Hook. f. Fl. Brit. India, vi, 439.

Usually slender climbing, more or less spinose or aculeate polycarpic palms, never totally unarmed, rarely tufted or with an erect stem, never bearing terminal inflorescences. *Leaves* alternate pari- or imparipinnate or produced into a rudimentary or more often elongate and armed cirrus, very exceptionally flabellato-furcate or subradiately digitate. *Leaflets* commonly narrow, more rarely ovate or rhomboid, never sigmoid or decurrent along the rachis, inserted with a narrow and often plicate base, with 1–5 or rarely more costæ or ribs, these subparallel and converging to an acuminate point, very seldom praemorse or truncate at the apex or with the nerves divergent and partly evanescent at different levels near the margin and not reaching the apex. *Stem* with long internodes, covered at first with sheaths forming the basal portion of the leaves. *Leaf-sheaths* usually complete and cylindric, rarely open on the ventral side, usually provided at the mouth with a more or less developed persistent or deciduous ocrea, coriaceous, elongated, generally spinous, with or without a lateral elongate clawed filiform flagellum. *Spadices* dioecious, usually laterally attached at the summit of the sheaths, almost similar in both sexes, often elongate and slender, frequently produced into a long thorny flagellum or at least into a more or less elongate tail-like appendix, more rarely broadly paniculate, much branched and diffuse. *Spathes* of the main axis (primary spathes) long, tubular, sheathing, rarely split longitudinally and expanded or laminar, very exceptionally cymbiform or auriculiform; secondary spathes (spathes of the branches or branchlets) smaller, but similar to the primary ones; lowest primary spathe always persistent, tubular and flattened, at least at its base. *Partial inflorescences* or branches of the male spadix usually panicled, or branched two or three times, the ultimate divisions being formed by more or less elongate. usually complanate or more rarely subscorpioid spikelets. *Spikelets* with a vermicular or slender axis, which is sheathed with shortly tubular or infundibuliform appendicular organs or spathels. *Male spadix* usually ultradecompound, rarely simply decompound. *Male flowers* solitary or very rarely glomerulate or subspicate at the mouth of every spathel, furnished with a cupuliform involucre sometimes replaced by two bracteoles. *Calyx* more or less tubular, 3-toothed or 3-lobate. *Corolla* coriaceous, always considerably longer than the calyx, divided almost to the base into 3 segments. *Stamens* 6, with subulate filaments which are shortly connate at the base; anthers dorsifixed. *Female spadix* more or less similar to the male but usually less branched, or simply decompound and with more or less numerous, frequently remote, partial inflorescences. *Female spikelets* almost always distichously inserted, usually longer than the male ones, but similarly sheathed with short tubular infundibuliform spathels bearing a double usually cupuliform involucre; the exterior or involucrophorum (spathellule) sessile or more rarely pedicillate; the interior (the true involucre or floral cup) moulded on the exterior and bearing externally a small areola or niche upon which is inserted a neuter or sterile flower. *Female flowers* usually flatly distichous on each side of the axis of the spikelets, or disposed in two collateral series where the flowers are more or less pointing upwards, almost always solitary, very rarely geminate at each spathel, always accompanied by a more or less speedily deciduous sterile flower. *Fertile female flowers* almost always smaller or at least less elongate than the male ones; calyx more or less tubular, 3-lobate; corolla usually as long as the calyx, 3-partite; both calyx and corolla persistent, split and expanded under the fruit or with the calyx slightly accrescent, callous and indurated at its base and forming a pedicel to it; staminodes forming a cup crowned by 6 short teeth and these bearing a sagittate abortive anther; ovary clothed with retrorse scales, 3-celled, with very thin membranous and very soon obliterated dissepiments; style short or conic; stigmas 3, usually thickly subulate and internally lamellose; ovules 3, anatropous, basilar, erect. *Neuter flowers* usually smaller or at least more slender than the female ones, with well conformed calyx and corolla and 6 abortive stamens and an ovary generally more like the male than the female ones. *Fruit* globose, ovoid or ellipsoid, topped by the short permanent style and often by the recurved stigmas; pericarp thin crustaceous, clothed with appressed deflexed imbricating polished hard scales. *Seed* only one, or very exceptionally 2–3, oblong subglobose or lenticular, rarely angular or flattened, with smooth, pitted or grooved surface; generally concave or foveolate on the side of the chalaza, usually enveloped by a scanty acidulous and mucilaginous fleshy integument; albumen equable or subruminate or with superficial intrusion of the integument or less frequently distinctly and deeply ruminate; embryo commonly basal or nearly so, seldom lateral.

GEOGRAPHICAL DISTRIBUTION.—Tropical and subtropical Asia; Indian and Malayan Archipelagos; the Philippines; New Guinea; North-East Coast of Australia; a few species in Tropical Africa.

Anomalous or infrequent characters occurring in the species of *Calamus*.

Stem erect and robust in *C. arborescens* and *erectus*; erect and slender like a walking cane in *C. bacularis*, *castaneus*, *ramosissimus*, *perakensis*, *Lobbianus* and probably in a few others; very short and tufted in *C. salicifolius* and *tonkinensis*; subscandent in *C. acanthospathus* and perhaps in *C. Oxleyanus*; creeping at the base and short in *C. Griffithianus*; almost wanting in *C. pygmæus*.

Leaf-sheaths not tubular, opened on the ventral side and gradually passing into the petiole in the non-scandent species.

Ocrea extraordinarily large, bilobed and hispid in *C. erectus*; very elongate and auriculiform in *C. macrochlamys*, *ralumensis* and a few other allied Papuan species.

Leaflets simply furcate-flabellate in *C. flabellatus*; very few and digitate in *C. digitatus*; very few and radiate in *C. radiatus*; rhomboid and with the outer main nerves not reaching the apex in *C. rhomboideus*, *spectabilis*, *Bousigonii*, *Blumei*, *tomentosus*; truncate and praemorse at the apex in *C. caryotoides*; distinctly chalky white beneath in *C. arborescens*, *leucotes*, *hypoleucus*, *Lobbianus*, *discolor*; bearing rigid spinules on the main nerves in *C. spinifolius* and *salicifolius*; more or less densely hairy in *C. sarawakensis*, *piloselus*, *hispidulus*.

Spadix simply branched or bearing simple spikelets at each primary spathe in *C. simplex*; male and female very similar when in flower in *C. melanoloma*; short, non-cirriferous, unarmed and with broad cymbiform spathes in *C. hypoleucus*; with only one or very few short compact partial inflorescences in *C. Lobbianus*, *conirostris*, *brachystachys*; paniculiform and shorter than the leaves in *C. macrochlamys* and in many of the species of Group XV.

Primary spathes very loosely sheathing and subinflated in *C. siphonospathus* and allied species; greatly lacerate in *C. erectus*; membranous and cymbiform in *C. hypoleucus*; elongate, laminar and open flat in *C. platyspathus* and allied species.

Spikelets with very closely packed and not distinctly bifarious flowers in *C. gonospermus* and *Lauterbachii*, and in lesser degree in *C. Lobbianus*, *conirostris*, *brachystachys*.

Male flowers glomerulate or with diminutive spikelets at each spathel in *C. fasciculatus*.

Female flowers geminate at each spathel with a single neuter flower between the two in *C. siamensis*, *pachystachys*, *didymocarpus*; geminate and with a neuter flower at each female flower in *C. fertilis*.

Neuter flower very conspicuous and almost as large as the fertile ones in *C. Ridleyanus*, *tenuis*, *Delessertianus* and apparently also in *C. deerratus* and *Perrottetii*.

Fruit with 3 seeds in *C. trispermus*, *manillensis* and occasionally in *C. Burckianus*; two equally developed seeds sometimes also in *C. Huegelianus*.

Seed radiately plicate and subcerebriform in *C. ciliaris* and allied species; deeply ruminate in *C. erectus*, *Flagellum*, *Huegelianus*, *Gamblei*, *gracilis*, *melanacanthus*, *Diepenhorstii*, *zeylanicus*, *densiflorus*, *macrosphaerion*, *Lobbianus*, *conirostris*, *brachystachys* and in many of the species of Group XV; with smooth not pitted or tubercled surface in *C. Burckianus*, *ramosissimus*, *Kunzeanus*, *paspalanthus*; very irregular in *C. ornatus*; angular in *C. gonospermus*; flattened in *C. paspalanthus*, with the surface fibrous velvety in *C. aquatilis*; covered with a green bitter stuff in *C. ciliaris* and allied species.

Embryo lateral in *C. gracilis*, *melanacanthus*, *Kunzeanus*, *symphysipus*, *densiflorus*, *Manar*, and in *C. ciliaris* and allied species.

SYSTEMATIC CONSPECTUS OF THE SPECIES.

GROUPS I–X.—Leaves never cirriferous.
„ XI–XIII.—Leaves shortly cirriferous with diminutive leaflets at their summit or very exceptionally not cirriferous.
„ XIV-XV.—Leaves distinctly cirriferous.
GROUP XVI.—Anomalous.

GROUP I.—*Leaves* not cirriferous (viz., with rachis not prolonged into a filiform aculeate appendix). *Leaflets* many, elongate. *Primary spathes* elongate-tubular, dilated and lacerate in their upper part. *Spadix* with the partial inflorescences and spikelets provided with a pedicellar part which remains included in their respective spathes. *Fruiting perianth* explanate (not forming a pedicel to the fruit). *Involucrophorum* of the female spikelets short, not pedicelliform. *Seed* with ruminate albumen; embryo basilar or nearly so.

A.—*Stem erect. Leaf-sheaths not flagelliferous.*

1. C. erectus.

B.—*Scandent. Leaf-sheaths flagelliferous.*

2. C. Flagellum.

GROUP II.—*Leaves* not cirriferous. *Leaflets* numerous, elongate. *Primary spathes* elongate-tubular, more or less lacerate in their upper part. *Fruiting perianth* explanate. *Involucrophorum* short, not pedicelliform. *Seed* (where known) with equable albumen and basilar embryo.

A.—*Spikelets not inserted at the bottom of their respective spathes and therefore not or very shortly pedicellate.*

† Not scandent. Spadix not flagelliform, and armed only with straight spines (not clawed).

3. C. arborescens, 4. dongnaiensis.

†† Scandent. Spadix flagelliform, clawed on the axial parts between the partial inflorescences.

5. C. longisetus, 6. Thwaitesii, 7. rudentum, 8. leptospadix.

B.—*Spikelets inserted at the bottom of their respective spathes and provided with a distinct pedicellar part. Not scandent. Spadix not flagelliform. Leaf-sheaths not flagelliferous.*

(The species of this group appear related to those of Group XIV, which, however, have cirriferous leaves.)

9. C. dilaceratus, 10. castaneus, 11. Griffithianus, 12. Burckianus.

GROUP III.—*Leaves* not cirriferous. *Leaflets* narrow elongate. *Leaf-sheaths* flagelliferous. *Spathes* (primary and secondary) elongate-tubular, strictly sheathing. *Spadix* elongate flagelliform. *Spikelets* not inserted at the bottom of their respective spathes by means of a pedicellar part. *Involucrophorum* almost stalked, attached to the bottom of its own spathel (not laterally adnate to the base of the spathel above its own). *Fruiting perianth* explanate. *Seed* with equable albumen and basilar embryo; all African.

13. C. deerratus, 14. Barterii, 15. Heudelotii, 16. falabensis, 17. Leprieurii, 18. Perrottetii, 19. akimensis, 20. Schweinfurthii.

GROUP IV.—*Leaves* not cirriferous. *Leaflets* very few, pinnate, digitate or radiate. *Primary spathes* very narrow and elongate-cylindraceous, very closely sheathing. *Leaf-sheaths* flagelliferous. *Spadices* (male and female) simply decompound, very slender and flagelliform; partial inflorescences and spikelets inserted at the mouth of their respective spathes (not with a pedicellar part). *Fruiting perianth* explanate. *Involucrophorum* not pedicelliform. *Seed* with equable albumen and basilar embryo.

21. C pachystemonus, 22. digitatus, 23. radiatus.

GROUP V.—*Leaves* not cirriferous, pinnate (simple and furcate in *C. flabellatus*). *Leaf-sheaths* provided in the scandent species (when not bearing spadices) with a long-clawed flagellum; in the non-scandent species the flagellum rudimentary or none. *Primary spathes* very elongate tubular, closely sheathing, sometimes split longitudinally in their upper part, but never entirely opened longitudinally and laminar. *Spikelets* inserted at the mouth of their respective spathes. *Involucrophorum* not pedicelliform. *Seed* (where known) not ruminate; embryo basilar.

A.—*Secondary spathes, spathels and involucra conspicuously scabrid.*

† Leaflets few, inequidistant.

24. C. ruvidus, 25. scabridulus, 26. muricatus, 27. zonatus

†† Leaflets rather numerous, equidistant.

28. C. radulosus, 29. rugosus.

B.—*Secondary spathes, spathels and involucra not or very slightly scabrous.*

(*1*) *Fruiting perianth* (*where known*) *explanate or subcallous at the base, not or slightly pedicelliform* (*distinctly pedicelliform in C. dioicus*).

† Leaves simply furcate.

30. C. flabellatus.

†† Leaves pinnate with few often broad lanceolate or elliptic or more rarely elongate, 3–5-costulate leaflets, all the costæ reaching the apex.

* The two terminal leaflets highly connate, acute or acuminate.

31. C. javensis, 32. filiformis, 33. corrugatus, 34. papuanus, 35. filipendulus, 36. gonospermus, 37 floribundus, 38. interruptus.(1)

** The two terminal leaflets slightly connate or free at the base, acute or acuminate.

39. C. dioicus, 40. schistoacanthus,(2) *41. Kingianus, 42. Muellerii.*

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(1), (2) Doubtfully placed here, the spadices and the fruit being unknown.

*** Leaflets truncate and praemorse at the apex; the two of the terminal pair highly connate.

43. *C. caryotoides.*

††† Leaves with numerous leaflets, these narrow, often fascicled, usually gradually decreasing towards the apex, the two of the terminal pair the smallest and free at the base.

* Fruiting perianth entirely explanate.

44. *C. viminalis,* 45. *siamensis,* 46. *concinnus,* 47. *mollis,* 48. *Meyenianus,* 49. *Blancoi,* 50. *rivalis,* 51. *Metzianus,* 52. *pseudo-rivalis,* 53. *pseudo-tenuis,* 54. *Hookerianus,* 55. *nematospadix,* 56. *australis,* 57. *Moti,* 58. *radicalis,* 59. *zebrinus,*(1) 60. *serrulatus.*(2)

** Fruiting perianth slightly callous at the base and more or less pedicelliform.

⊙ Ocrea not extraordinarily large.

61. *C. Reinwardtii,* 62. *heteroideus,* 63. *opacus,* 64. *luridus,* 65. *sabensis,* 66. *delicatulus,* 67. *Helferianus,*(3) 68. *nicobaricus.* Apparently related to the species of this group are the following:—69. *C. myriacanthus,* 70. *pygmæus,* 71. *barbatus.*

⊙⊙ Ocrea elongate, very large.

72. *C. vestitus,* 73. *ralumensis,* 74. *macrochlamys,* 75. *gogolensis.*

(2) *Fruiting perianth distinctly pedicelliform.*

† Leaflets numerous, narrow, equidistant, gradually becoming smaller towards the apex of the leaf.

76. *C. tenuis,* 77. *horrens,* 78. *Godefroyi,* 79. *Rotang,* 80. *Walkerii,* 81. *Faberii,* 82. *tonkinensis,* 83. *Delessertianus.*

†† Leaflets not very numerous, and distinctly fascicled.

84. *C. Brandisii,* 85. *salicifolius,* 86. *tetradactylus.* (*C. salicifolius* perhaps better placed in Group XIII by its diminutive terminal leaflets.)

††† Leaflets more or less inequidistant, but not fascicled, many-nerved.

87. *C. acanthospathus,* 88. *Feanus.*

GROUP VI.—*Leaves* not cirriferous. *Leaflets* elongate. *Primary spathes* very long, tubular and closed at first, later longitudinally split and open, loriform or laminar. *Involucrophorum* not pedicellate. *Seed* (where known) not alveolate, with equable albumen. In *C. bacularis* the spathes simply partially split longitudinally.

† Not scandent.

89. *C. bacularis,* 90. *perakensis,* 91. *ramosissimus.*

†† Scandent.

92. *C. paspalanthus,* 93. *Guruba,* 94. *nitidus,* 95. *platyspathus,* 96. *myrianthus,* 97. *hypoleucus,* 98. *leucotes.*

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(1), (2), (3) Doubtfully placed here, being known in a sterile condition only.

GROUP VII.—*Leaves* not cirriferous. *Leaflets* elongate. *Leaf-sheaths* flagelliferous. *Primary spathes* at first tubular, later more or less split longitudinally and partly laminar. *Involucrophorum* distinctly pedicellate. *Fruiting perianth* pedicelliform.

99. C. *travancoricus*, 100. *Rheedei.*

GROUP VIII.—*Leaves* not cirriferous. *Leaflets* elongate. *Leaf-sheaths* flagelliferous. *Primary spathes* tubular, strictly sheathing, not split or lacerate. *Involucrophorum* distinctly pedicellate. *Fruiting perianth* pedicelliform. *Seed* with deeply ruminate albumen.

101. C. *Huegelianus*, 102. *Gamblei.*

GROUP IX.—*Leaves* not cirriferous. *Leaflets* elongate and narrow. *Leaf-sheaths* flagelliferous. *Primary spathes* strictly sheathing. *Involucrophorum* in the female spikelets not pedicelliform. *Fruiting perianth* pedicelliform. *Seed* deeply ruminated.

103. C. *gracilis*, 104. *melanacanthus*, 105. *Diepenhorstii*, 106. *marginatus.*

GROUP X.—*Leaves* not cirriferous. *Leaflets* numerous, elongate and narrow. *Leaf-sheaths* flagelliferous. *Primary spathes* strictly sheathing. *Involucrophorum* distinctly pedicelliform. *Fruiting perianth* pedicelliform. *Seed* plicate-cerebriform, or with many deep plicæ, radiating from the centre of one face to the centre of the other.

107. C. *ciliaris*, 108. *exilis*, 109. *hispidulus*, 110. *pilosellus*, 111. *sarawakensis.*

GROUP XI.—*Leaves* not or very rudimentarily cirriferous. *Leaf-sheaths* flagelliferous. *Leaflets* broad and short, radiately many-nerved; only their mid-costa reaching the apex, the other nerves evanescent at different levels, the two terminal completely free, often with a very short or rudimentary cirrus interposed. *Spathes* tubular, closely sheathing. *Involucrophorum* not pedicelliform. *Fruiting perianth* subpedicelliform. *Seed* (where known) superficially ruminated; embryo basilar.

112. C. *rhomboideus*, 113. *tomentosus*, 114. *Blumei*, 115. *spectabilis*, 116. *Bousigonii.*

GROUP XII.—*Leaves* more or less prolonged into a sometimes abortive cirrus (in *C. Cuthbertsonii* not cirriferous). *Leaf-sheaths* not flagelliferous (always?). *Leaflets* usually many-nerved. *Male spikelets* with biseriate, subsecund (not flatly bifarious) flowers. *Involucrophorum* distinctly pedicelliform. *Seed* (where known) not or slightly ruminated.

117. C. *heteracanthus*, 118. *symphysipus*, 119. *Cumingianus*, 120. *vitiensis*, 121. *kandariensis*, 122. *adspersus*, 123. *plicatus*, 124. *Minahassæ*, 125. *Cawa*, 126. *equestris*, 127. *Cuthbertsonii.*

GROUP XIII.—*Leaves* of the young plant not prolonged into a cirrus, of the adult one shortly or subcirriferous, viz., with diminutive leaflets at their summit. *Leaflets* lanceolate or elliptic with 3 or more primary nerves, these all reaching the apex. *Leaf-sheaths* flagelliferous. *Spadix* flagelliform. *Primary spathes* elongate, tubular, narrow. *Involucrophorum* not or very shortly pedicelliform. *Fruiting perianth* pedicelliform. *Seed* with a non-ruminate albumen or with superficial intrusions of the integument or distinctly ruminate.

128. C. *spathulatus*, 129. *Martianus*, 130. *insignis*, 131. *ornatus*, 132. *Scipionum*, 133. *densiflorus*,(1) 134. *Ridleyanus.*(1)

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(1) Of uncertain position.

GROUP XIV.—*Leaves* prolonged into a long and clawed cirrus. *Leaf-sheaths* not flagelliferous. *Spadix* not flagelliferous at its apex, usually shorter than the leaves. *Primary spathes* elongate-tubular, closely sheathing. *Male spadix* ultradecompound. *Female spadix* simply decompound, differing considerably from the male one. *Male* and *female spikelets* stalked or inserted at the base of their respective spathes by means of a distinct pedicel. *Fruiting perianth* explanate. *Seed* with ruminate or equable albumen (*see* Group II, B).

135. C. zeylanicus, 136. ovoideus, 137. polystachys, 138. andamanicus, 139. Zollingerii, 140. Merrillii, 141. aquatilis, 142. Warburgii.

GROUP XV.—*Leaves* prolonged into a long and clawed cirrus. *Leaf-sheaths* not flagelliferous. *Spadices* usually shorter than the leaves, not or slightly flagelliferous at the apex. *Spikelets* not stalked, inserted near the mouth of their respective spathes. *Fruiting perianth* pedicelliform or almost explanate. *Seed* with more or less superficial intrusions of the integument or distinctly ruminate; embryo basilar or slightly shifted to one side.

A.—*Fruiting perianth not pedicelliform or subpedicelliform, viz., with the calyx split not quite to the base.*

143. C. Moseleyanus, 144. formosanus, 145. polydesmus, 146. Rumphii, 147. palustris, 148. latifolius, 149. spinifolius, 150. trispermus, 151. manillensis, 152. axillaris, 153. neglectus, 154. bubuensis, 155. viridispinus, 156. mucronatus, 157. asperrimus.

B.—*Fruiting perianth distinctly pedicelliform.*

(*1*) *Primary spathes very closely sheathing.*

† Male spikelets very different from the female ones.

* One female flower at each spathel accompanied as usual by a neuter one.

⊙ Involucrophorum sessile.

158. C. erioacanthus, 159. optimus, 160. cæsius, 161. simplex, 162. Doriæi, 163. khasianus, 164, nambariensis, 165. inermis, 166. Manan, 167. giganteus, 168. platyacanthus, 169. albus, 170. pallidus, 171. macrosphærion, 172. muttanensis, 173. Oxleyanus, 174. microsphærion, 175. ramulosus.

⊙ ⊙ Involucrophorum more or less stalked.

176. C. unifarius, 177. subinermis, 178. pisicarpus, 179. aruensis; 180. Hollrungii.

** Often two female flowers at every spathel.

181. C. Vidalianus, 182. pachystachys, 183. didymocarpus.

†† Male spikelets very similar to the female ones.

184. C. melanoloma.

(*2*) *Primary spathes loosely sheathing and often more or less inflate.*

185. C. siphonospathus, 186. microcarpus, 187. dimorphacanthus.

GROUP XVI (Subgenus).—*Leaves* subimparipinnate or subcirriferous. *Male* and *female spadices* contracted, similar. *Lowest primary spathe* tubular at the base and somewhat dilated and elongate-auriculiform upwards. *Partial inflorescences* very few, usually only one, very dense with approximate and very closely-packed flowers. *Fruiting perianth* campanulate, split down to the base. *Seed* deeply ruminate, with basilar embryo.

188. C. conirostris, 189. Lobbianus, 190. brachystachys.

SPECIES OF DOUBTFUL POSITION.—

191. C. Henryanus, 192. thysanolepis, 193. ferrugineus, 194. Kunzeanus, 195. Lauterbachii, 196. fertilis, 197. Macgregorii, 198. Hartmannii, 199. discolor, 200. acidus, 201. Harmandi.

CALAMUS LINN.

SYNOPSIS OF THE SPECIES.*

1. ***C. erectus*** Linn.—*Stem* erect, robust, with a crown of large leaves. *Ocrea* very large, divided into two very large hispid auricles. *Leaves* 3–5 m. long. *Leaflets* very numerous, equidistant, large, elongate-ensiform, green on both surfaces, their mid-costa sparingly bristly and the secondary nerves naked on both surfaces. *Leaf-rachis* armed beneath with long straight spines which are whorled in its lower part and especially on the petiole. *Spadix* not or very shortly flagelliferous at its apex. *Primary spathes* loosely sheathing, speedily lacerated and marcescent. *Fruit* large, ellipsoid, 3–4 cm. long. *Seed* oblong or ovoid, circular in transverse section; embryo basilar, slightly eccentric.

N. Burma.

C. erectus var. ***schizospathus*** Becc.—*Leaflets* with a secondary nerve on each side of the mid-costa, sparingly bristly beneath and sometimes also above. *Male flower* with the calyx half (not almost entirely) projecting from the involucres.

Sikkim.

C. erectus var. ***birmanicus*** Becc.—*Female spadix* shortly cirriferous. *Fruit* smaller.

Burma: Karen Mts.

2. ***C. Flagellum*** Griff.—Scandent and robust. *Leaf-sheaths* armed with very unequal never seriate spines. *Ocrea* marcescent. *Leaf-sheath flagella* up to 6–7 m. long. *Leaves* very large. *Leaflets* numerous, equidistant, green on both surfaces, broadly ensiform, strongly unicostate; the mid-costa with a few sub-spiny bristles, the secondary nerves naked on both surfaces. *Leaf-rachis* clawed on the back. *Spadix* very elongate, flagelliform. *Primary spathes* tubular, closely sheathing, lacerated and fibrous at the apex. *Fruit* about 3 cm. long, broadly ovoid. *Seed* ovoid, circular in transverse section; embryo basilar.

N. E. India.

C. Flagellum var. ***karinensis*** Becc.—*Leaf-sheaths* armed with very unequal spines, of which some are large and others small and seriate.

Burma: Karen Mts.

3. ***C. arborescens*** Griff.—Cæspitose. *Stem* erect, robust, 4–6 m. high, with a crown of large leaves. *Leaf-sheaths*, petiole and leaf-rachis armed with large laminar, almost black, shining, seriate spines. *Leaflets* numerous, equidistant, large, broadly ensiform, green above, white underneath. *Male spadix* elongate, pendulous. *Primary spathes* tubular, rather closely sheathing, lacerated and fibrous in their upper part, armed—as are the other parts of the plant—only with straight black spiculæ and never with hooked spines or claws. *Secondary spathes* clavate-subinflated and usually lacerated and blackened. *Spikelets* very large, with very regularly set, flatly bifarious flowers.

Burma: Pegu.

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* From these diagnoses the characters which serve to distinguish the groups are usually omitted.

4. *C. dongnaiensis* Pierre.—Very similar to the preceding. *Leaves* large, the petiole and leaf-rachis armed with large, laminar, almost black, shining seriate spines. *Leaflets* numerous, equidistant, large, broadly ensiform, green on both surfaces, their mid-costa furnished beneath with some stiff spadiceous bristles and spinulose above. *Male spadix* large elongate. *Primary spathes* tubular, rather closely sheathing, lacerate and fibrous in their upper part, armed like the other parts of the plant only with straight black spicules and never with hooked spines or claws; secondary spathes clavate-subinflated and usually lacerate. *Male spikelets* very large, with regularly set, flatly bifarious flowers.

Cochin-China.

5. *C. longisetus* Griff.—Large and scandent. *Leaves* up to 3–4 m. long. *Leaflets* inequidistant, often in groups of 2—3, subequidistant towards the summit, green on both surfaces, large, ensiform, unicostate, mid-costa remotely spinulose above, furnished beneath with some very long blackish bristles. *Male* and *female spadices* simply decompound. *Primary spathes* elongate-tubular rather loosely sheathing, lacerate in their upper part; secondary spathes slightly inflated, and also more or less lacerate. *Female spikelets* very large with comparatively very large flatly bifarious flowers. *Fruit* ellipsoid-ovate, 30–33 mm. long, transversely mottled like a tiger skin. *Seed* oblong, 5–7-costate.

Pegu; Andamans.

6. *C. Thwaitesii* Becc.—Robust. *Leaves* large. *Leaflets* irregularly fascicled, large, broadly ensiform, green on both surfaces, unicostate; mid-costa furnished on both surfaces with black, short, subspiny bristles; secondary nerves naked on both surfaces; rachis of the leaves of the upper part of the plant armed beneath with solitary claws. *Male* and *female spadices* simply decompound, flagelliform, with the axial parts between the inflorescences very elongate and strongly clawed; primary spathes very long, very narrow, thinly coriaceous, very closely sheathing, withered and lacerated near the mouth. *Male* and *female spikelets* very elongate. *Fruit* ellipsoid or obovate-elliptic, suddenly contracted into a conic beak, 22–25 mm. long; scales in 12 series, broadly channelled along the middle.

Ceylon.

C. Thwaitesii var. *canaranus* Becc.—*Male spikelets* with more numerous and more approximate flowers; the seed more flattened than in the Ceylon plant.

Canara.

7. *C. rudentum* Lour.—Rather large and high scandent. *Leaves* large. *Leaflets* numerous, equidistant, very long, linear-ensiform, shining and green on both surfaces, unicostate; the mid-costa spinulose above, with very few, very long spadiceous bristles beneath; secondary nerves naked on both surfaces. *Spadices* with the axial part between two inflorescences very elongate and strongly clawed; primary spathes cylindraceous, very elongate, closely sheathing, often split longitudinally and terminating in a lanceolate, sparsely aculeate, not lacerate limb. *Male spadix* ultradecompound. *Male spikelets* 7–11 cm. long, inserted just at the mouth of their own spathe, with approximate, rather large, flatly bifarious flowers. *Female spikelets* furnished with a short pedicellar part, 20–25 cm. long.

Cochin china.

8. **C. leptospadix** Griff.—Slender. *Leaf-sheaths* densely and irregularly armed with straight, subulate spines. *Leaves*, 6–1 m. long. *Leaflets* numerous, approximate, very regularly equidistant, linear-ensiform, 20–30 cm. long, 3-costate. *Male* and *female spadices* simply decompound and similar, excessively long and slender; *partial inflorescences* not many, very distant, strict, slender, 20–40 cm. long with 10–20 appressed spikelets on each side; *primary spathes* very narrow, very long, cylindrical, closely sheathing. *Male spikelets* scorpioid, 1–2 cm. long, issuing erect from the auriculiform limb of their respective spathes. *Fruit* globose or globose-ovoid, about 10 mm. in diam.

N. E. India.

9. **C. dilaceratus** Becc.—*Female spadix* erect, paniculate; *primary spathes* short, membranous, exsuccous, lacerate, armed with fine black spicules; *secondary spathes* tubular-infundibuliform and—like the spathels—exsuccous, thin in texture and much lacerate; *female spikelets* with a pedicellar portion 1–1·5 cm. long. *Fruiting perianth* divided into six spreading, equal, lanceolate parts. *Fruit* small, ovate, 12 mm. long. *Seed* subglobose, its surface even (not pitted).

Nicobar Islands.

10. **C. castaneus** Griff.—*Stem* erect, 1–1·5 m. high. *Leaves* with the petiole flattish above and rounded beneath. *Leaflets* numerous, broadly ensiform, 4–5·5 cm. broad, green on both surfaces, slightly paler beneath; mid-costa bristly spinulose on both surfaces; secondary nerves always smooth. *Female spadix* short and broad; secondary spathes elongate-infundibuliform with an auriculiform limb, loosely sheathing, ultimately decayed but not fibrous in their upper part; spikelets provided with a pedicellar part 1·5–2 cm. in length. *Fruit* rather large, 22–24 mm. long, broadly ovoid or obovate, distinctly beaked, of an uniform chestnut-brown colour; scales in 24–27 longitudinal series. The different parts of the plant armed only with straight, never with clawed prickles.

Malayan Peninsula.

11. **C. Griffithianus** Mart.—*Stem* creeping at first, then ascending erect. *Leaves* with a very long subterete petiole. *Leaflets* numerous, in alternate groups on each side of the rachis, equidistant in each group, elongate-ensiform, 15–35 mm. broad, green above, pulverulent or slightly mealy-violaceous underneath when young, later green, with bristles on 3 nerves on the lower surface and only on the mid-costa near the apex on the upper. *Spadices* rather short; spathes tubular-auriculiform and ultimately decayed but not fibrous in their upper part; spikelets provided with a long pedicellar part and inserted at the base of their respective spathes. *Fruit* subglobose-obovate, very suddenly and conspicuously beaked, of an uniform chestnut-brown colour; scales in 18–24 series. The different parts of the plant armed only with straight, never with clawed prickles.

Malayan Peninsula.

12. **C. Burckianus** Becc.—*Leaves* with a long, terete, compressed petiole. *Leaflets* numerous, equidistant, linear-ensiform, distinctly 3-costulate; secondary spathes tubular-infundibuliform, truncate, entire or at most longitudinally split, unarmed. *Female spikelets* elongate, inserted at the base of their own spathes by a slender, 2–3 cm.

long pedicellar part. *Fruit* globose, small, 10–12 mm. in diam., apiculate, of an uniform brown colour. *Seed* with a smooth surface.

Java.

13. C. deerratus Mann & Wendl.—*Sheathed stem* 18–25 mm. in diam. *Leaf-sheaths* more or less armed with straight laminar spines. *Ocrea* 4–5 cm. long, membranous, spinous like the sheath, ultimately marcescent. *Leaves* about 1 m. long; petiole short. *Leaflets* rather numerous, subequidistant, linear-lanceolate or lanceolate-ensiform. *Male* and *female spadices* simply decompound with very few erect strict partial inflorescences. *Male spikelets* 4–5 cm. long. *Female spikelets* slightly larger than the male ones. *Fruit* ovoid, conically narrowing towards the apex, 15–17 mm. long; scales 21 series.

West Tropical Africa: Bagroo and Cameroons Rivers.

14. C. Barterii Becc.—*Stem* very slender. *Leaf-sheaths* striate, unarmed. *Ocrea* 12–15 mm. long, bilobed, bristly spinulose externally at the apex and at the margins. *Leaves* 45–50 cm. long; the petiole 6–8 cm.; rachis slender, filiform. *Leaflets* few, 9–10 on each side spreading or almost horizontal, grouped in rather distant fascicles of 2–4 on each side, thin in texture, linear-lanceolate, the two of the terminal pair opposite, free at the base.

W. Tropical Africa: River Niger.

15. C. Heudelotii Becc.—*Sheathed stem* about 1 cm. in diam. *Leaf-sheaths* armed with very small semi-conical spines. *Ocrea* 2 cm. long, obliquely cut like the mouth of a beaked flute and externally ornamented with closely seriate comb-like spines. *Leaves* about 60–70 cm. long, petiole 7–8 cm. long. *Leaflets* about 18–20 on each side, irregularly approximate with short and long vacant spaces interposed, linear-lanceolate or lanceolate-ensiform, smooth beneath or with a few very small spinules only along the mid-costa; the upper surface with the mid-costa spinulose and the side nerves naked or sparingly spinulose. *Female spadix* with the axial parts between two inflorescences strongly clawed. *Partial inflorescences* small with few arched and deflexed spikelets. *Fruit* ovoid conically beaked, 15 mm. long, 9 mm. broad; scales in 15–16 series.

West Tropical Africa: Senegambia, Gambia.

16. C. falabensis Becc.—Apparently slender. *Leaflets* inequidistant, inserted at a rather acute angle, with vacant spaces variable from 2–7 cm., papyraceous, rather rigid, very narrowly lanceolate, the largest about 20 cm. long, 18–20 mm. broad, with 3 bristly spinulous nerves beneath and the mid-costa only bristly spinulous above. *Male spadix* elongate flagelliform. *Partial inflorescences* lax, rather large with many spreading elongate arched spikelets on each side. *Male flowers* falcate, very acute.

West Tropical Africa: Sierra Leone.

17. C. Leprieurii Becc.—*Leaves* short, 35–40 cm. long; the petiole 7–10 cm. long. *Leaflets* rather many and approximate, more or less inequidistant or interruptedly equidistant, 15 mm. apart, narrowly lanceolate, 15–17 cm. long, 15 mm. broad and often with a small spinule at their base in the upper surface next to the axis; secondary nerves smooth. *Male spadix* elongate with a long clawed flagellum at its apex; the largest partial inflorescences 30 cm. long with 7–8 spreading spikelets on each side; male flowers ovate, obtuse, straight. *Female spadix* with very elongate partial inflorescences which vary from 30–50 cm. in length and bear up to 12 spikelets on each side; spathels prolonged at one side into a triangular point; areola of the neuter flower concave, a good deal smaller than the cavity of the fertile flower.

West Tropical Africa: Senegambia.

18. C. *Perrottetii* Becc.—Slender, scandent. *Leaves* about 60 cm. long, the petiole apparently subcylindric. *Leaflets* rather many and approximate, more or less inequidistant or interruptedly equidistant, linear-lanceolate; the largest 18–20 cm. long, 12–14 mm. broad. *Female spikelets* arched and deflexed, 6–7 cm. long, their spathels broadly infundibuliform, subspathaceous and surrounding the involucra and the flowers; areola of the neuter flower concave and deep, forming a cavity almost as large as the cavity of the female flower so that the two cavities are almost of equal size.

West Tropical Africa: Senegal and Casamance river.

19. C. *akimensis* Becc.—*Female spadix* with rather large partial inflorescences; these elongate-pyramidate, in one specimen 50 cm. long with 15 gradually shortening spikelets on each side. *Spikelets* thick, vermicular, the largest, the lowest, 15 cm. long with about 25 flowers on each side; spathels spathaceous, broadly and obliquely infundibuliform, involucre large, sub-auriculiform, elongate on the side of the neuter flower. *Fruiting perianth* explanate. *Fruit* rounded at the base, conically ovoid or gradually narrowing at the apex to a conic beak, about 2 cm. long, 1 cm. broad; scales in 15 series. *Seed* oblong, superficially grooved, albumen equable; embryo basal.

Tropical Africa: Gold Coast.

20. C. *Schweinfurthii* Becc.—*Sheathed stem* 10–15 mm. in diam. *Leaves* in the penniferous part 80–90 cm. long, the petiole itself 25–30 cm. long, flat above and rounded beneath. *Leaflets* numerous, inequidistant, not distinctly fascicled, narrowly ensiform, the largest 30–38 cm. long, 15–20 mm. broad. *Ocrea* elongate, prolonged externally into a ligule and spinulous on the ventral side. *Female spikelets* rather thick, strongly arched and deflexed, 6–7 cm. long, with 14–19 flowers on each side, spathels broad, infundibuliform. *Fruit* ovoid 16–18 mm. long, 11–12 mm. broad, conically beaked; scales in 15–18 series and with a narrow erosely toothed margin.

Central Africa: Niam-Niam and Monbuttu country.

21. C. *pachystemonus* Thw.—Very slender. *Leaves* short, pinnate, 30–40 cm. long, the petiole very short. *Leaflets* very few, 2–3 on each side with a terminal pair, concavo-convex, ovate-or obovate-lanceolate or elliptic, suddenly acuminate, 3–5-costulate, the two of the terminal pair larger than the others, highly connate. *Male spadix* filiform with a few remote partial inflorescences; these elongate, strict, bearing short, subscorpioid spikelets. *Male flowers* cylindraceous, 5 mm. long, slightly curved.

Ceylon.

22. C. *digitatus* Becc.—Very slender. *Leaves* very short. *Leaflets* usually 2 or at most 3–4 in all, digitate or subpinnate, oblong-spathulate, 3–5-costulate, the two of the terminal pair more or less confluent by their bases; the others, when

present, more or less approximate to these. *Male spadix* filiform with a few remote partial inflorescences; these elongate, strict, with many short subscorpioid spikelets; *male* flowers cylindraceous, curved, 4 mm. long. *Fruit* globular, 9–10 mm. in diam.; scales in 12 series.

Ceylon.

23. *C. radiatus* Thw.—Very slender. *Leaves* not pinnate. *Leaflets* 5–8, radiate or digitate, broadly linear, unicostate, grouped at the apex of the petiole and not disposed at the sides of it. *Spadices* slender filiform. *Fruit* globular, 10–11 mm. in diam.; scales in 15 series.

24. *C. ruvidus* Becc.—Apparently slender or of moderate size. *Leaves* comparatively short. *Leaflets* very few, remote, alternate, oblanceolate, slightly concavo-convex, 28–30 cm. long, 3·5 cm. broad, 5-costulate, the costæ naked on both surfaces; the two of the terminal pair broader than the side ones and rather highly connate by their bases. *Female spadix* not flagelliferous, rather short with a few short and approximate partial inflorescences. *Primary spathes* decayed in their upper part. *Spikelets* 6–7 cm. long, rather thick, with numerous very approximate bifarious flowers; *secondary spathes*, *spathels* and *involucra* very scabrid. *Fruiting perianth* explanate. *Fruit* small, spherical.

Borneo.

25. *C. scabridulus* Becc.—Scandent, apparently slender or of moderate size. *Leaflets* not very numerous, subequidistant, 4–7 cm. apart, flat (not concavo-convex), narrowly lanceolate or ensiform, 40–45 cm. long, 2–2·5 cm. broad, 3-costulate the costæ bristly spinulous above and sparingly spinulous beneath near the apex; the two leaflets of the terminal pair slightly shorter and slightly broader than the side ones, shortly connate at their base. *Female spadix* seemingly elongate; *partial inflorescences* elongate with about 10 rather remote slender spikelets on each side; *secondary spathes*, *spathels* and *involucra* very scabrid.

Billiton.

26. *C. muricatus* Becc.—Slender, scandent. *Sheathed stem* 13–16 mm. in diam. *Leaf-sheaths* armed with very short, confluent, broad-based spines which rest on annular raised ridges; these alternating with interrupted wrinkles. *Leaves* with a long petiole. *Leaflets* about 14–15 on each side, very inequidistant but not grouped, linear, about 35 cm. long, 13–14 mm. broad, 3-costulate, the 3 costæ bristly above, beneath the mid-costa only bristly, the two terminal leaflets smaller than the side ones, free at the base.

Borneo.

27. *C. zonatus* Becc.—Very slender. *Sheathed stem* 7–8 mm. in diam. *Leaf-sheaths* ornamented with approximate annular prominent ribs, which are scabrid on their crest or sometimes furnished with pungent warts or rudimentary spines. *Leaves* 50–70 cm. long; petiole short (2–5 cm. long). *Leaflets* 10–12 on each side, inequidistant, not distinctly grouped, linear, 20–28 cm. long, 10–12 mm. broad, 3-costulate; the mid-costa sparingly bristly above, all nerves naked beneath. *Female spadix* elongate-filiform; spikelets very slender; *secondary spathes* and spathels scabrid.

Borneo.

28. **C. radulosus** Becc.—*Sheathed stem* 2·5–3 cm. in diam. *Leaf-sheaths* densely armed with obliquely inserted, ascending, triangular spines. *Leaves* rather large, 1·2–1·5 m. long; petiole none. *Leaflets* numerous, equidistant, 2–3 cm. apart, ensiform, the intermediate ones 45 mm. long, 25 mm. broad, 3-costulate, the 3 costæ bristly beneath towards the apex, on the upper surface only the mid-costa sometimes bristly; the upper leaflets gradually smaller, those of the terminal pair 13–15 cm. long, 8–12 mm. broad, shortly connate at the base. *Male spadix* ultra-decompound. *Female spadix* simple decompound, very long, with many, remote, very long, partial inflorescences; primary spathes elongate; lower spikelets 8–9 cm. long with 20–23 flowers on each side: secondary spathes, spathels and involucres strongly scabrid. *Fruiting perianth* explanate. *Fruit* small.

The Malayan Peninsula.

29. **C. rugosus** Becc.—Scandent, slender. *Sheathed stem* 8–10 mm. in diam. *Leaf-sheaths* armed with short triangular horizontal confluent subvertical laminar spines and with spinulous wrinkles interposed between the whorls of the larger spines. *Leaves* about 70 cm. long; the petiole elongate. *Leaflets* numerous equidistant, closely set, linear or linear-lanceolate, unicostate, 15–17 cm. long, 8–10 mm. broad, on the upper surface the mid-costa and one nerve on each side of it rather densely bristly, underneath only the mid-costa bristly; the terminal pair of leaflets slightly smaller than the others, free at the base. *Female spadix* filiform, with few very small partial inflorescences; these with few and short spikelets; secondary spathes and spathels scabrid.

The Malayan Peninsula.

30. **C. flabellatus** Becc.—Scandent, very slender. *Sheathed stem* 5–6 mm. in diam. *Leaf-sheaths* striate, unarmed. *Leaves* simple, elongate-flabelliform, furcate or parted into two broadly lanceolate, acuminate, acutely 6–7-costate lobes, green on both surfaces.

Borneo.

31. **C. javensis** Bl. (type).—Slender. *Sheathed stem* 5–8 mm. in diam. *Leaf-sheaths* longitudinally striate, sparingly armed with straight, 1–5 mm. long spines. *Leaves* short (30–50 cm. long); the petiole very short. *Leaflets* few, 3–6 on each side, oblong or elliptic, usually 2–3 cm. broad, the basilar pair spreading and the apical pair very highly connate. *Male* and *female spadices* filiform, very elongates, spikelets divaricate. *Fruiting perianth* subpedicelliform. *Fruit* 15–16 mm. long, ellipsoid-ovoid, tipped by a cylindric, 1·5–2 mm. long beak.

Java.

C. javensis var. **exilis** Becc.—*Sheathed stem* very slender, 4–5 mm. in diam.; petiole elongate (17 cm. long). *Leaflets* very narrow (1·5–2 cm. broad).

Java.

C. javensis var. **peninsularis** Becc.—*Stem* and *leaf-sheaths* more or less as in the type. *Leaves* 30–50 cm. long; the petiole very short or almost wanting. *Leaflets* very few, 3–6 on each side, inequidistant, elliptic or ovate-elliptic, 15–18 cm. long, relatively broad (3–6 cm.); the basal pair strongly deflexed, the apical pair connate for two-thirds of their length. *Fruit* subglobose, about 8 mm. in diam., tipped by a cylindric, 2·5 mm. long beak. *Scales* in 18 series.

The Malayan Peninsula.

C. javensis sub-var. *purpurascens* Becc.—*Leaflets* broader than usual (6–7 cm.), purpurescent, the basal two strongly deflexed, embracing the stem, and harbouring ants.

Pulo Penang and Perak.

C. javensis sub-var. *pinangianus* Becc.—*Leaf-sheaths* mottled, densely prickly. *Leaflets* subclustered, narrow, those of the basal pair not deflexed and not embracing the stem.

Pulo Penang.

C. javensis var. *tetrastichus* Becc.—*Sheathed stem* 6–7 cm. in diam. *Leaf-sheaths* striate, rather densely armed with short, broad-based, sometimes deflexed spines which have a tendency to become hooked. *Leaflets* few, oblanceolate, comparatively broad (3–4 cm.), those of the basal pair strongly deflexed, concave and embracing the stem; petiole very short. *Fruit* ellipsoid-ovoid, 12–13 mm. long including the beak, the beak itself 1·5 mm. long. *Fruiting perianth* completely explanate.

Borneo.

C. javensis var. *tenuissimus* Becc.—Excessively slender. *Sheathed stem* 3·25–4 mm. in diam.; naked canes 2 mm. in diam. *Leaves* about 40 cm. long, the petiole 5–8 cm. long. *Leaflets* usually 3 on each side of the rachis and opposite, the pairs remote, inequidistant, narrowly lanceolate or oblanceolate, thôse of the basal pair spreading, not embracing the stem. *Fruit* ovoid-ellipsoid, conspicuously beaked. *Scales* in 15 series.

Mountains of the Malayan Peninsula.

C. javensis var. *sublævis* Becc.—*Sheathed stem* 7–8 mm. in diam. *Leaf-sheaths* almost smooth. *Leaves* 45–80 cm. long; the petiole elongate. *Leaflets* inequidistant, 4–6 on each side.

Borneo.

C. javensis var. *polyphyllus* Becc.—*Sheathed stem* 7–8 mm. in diam. *Leaf-sheaths* rather densely beset with straight, horizontal, 5–6 mm. long spines. *Leaves* with about 10 lanceolate almost equidistant leaflets, the basal pair inserted very near the mouth of the sheath and deflexed.

Malayan Peninsula.

C. javensis var. *intermedius* Becc.—*Sheathed stem* 5–7 mm. in diam. *Leaf-sheaths* armed with many small, short, straight spines. *Leaflets* 6–7 on each side of the rachis, lanceolate or oblanceolate, the mesial 15–17 cm. long, 2 cm. broad, those of the basal pair not deflexed.

Malayan Peninsula.

C. javensis var. *acicularis* Becc.—Very slender. *Leaf-sheaths* with short or rather long, straight spines. *Leaves* short with only 2 pairs of leaflets which are approximate to the terminal pair; the basal pair transformed into two opposite, long, acicular spines. *Female spadix* shorter than the leaves.—Perhaps a distinct species.

Borneo.

32. *C. filiformis* Becc.—Excessively slender. *Sheathed stem* 3–5 mm. in diam.; naked canes sometimes not more than 2 mm. in diam. *Leaf-sheaths* smooth, or with very few hooked prickles. *Leaves* very delicate, 25–40 cm. long; the petiole very short. *Leaflets* 5–6 on each side, somewhat inequidistant, very narrowly lanceolate, 8–12 mm. long, 8–14 mm. broad, those of the terminal pair very highly connate. *Male spadix* filiform, very slender; partial inflorescences reduced to one spikelet.

Mountains of Borneo.

33. *C. corrugatus* Becc.—*Sheathed stem* 4–5 mm. in diam. *Leaf-sheaths* not prickly, but marked by many, approximate, prominent and annular ridges. *Leaves* 30–35 cm. long; petiole very short. *Leaflets* very few, 5 on each side, perfectly opposite and forming remote pairs, elliptic-lanceolate, 3-costulate, 12–13 cm. long, 2·5 cm. broad; those of the terminal pair united to about the middle.

Borneo.

34. *C. papuanus* Becc.—Very slender. *Sheathed stem* 6–8 mm. in diam. *Leaf-sheaths* sprinkled with very small ascending, tuberculiform prickles. *Leaves* short (about 30 cm long); the petiole about 2 cm. long. *Leaflets* few, 6–7 on each side, clustered in about 4 remote fascicles of 3–4 each, spreading, elliptic-lanceolate or broadly oblanceolate, suddenly subulately acuminate, 5-costulate, quite naked on both surfaces and at the margins, those of the terminal pair connate to about the middle.

New Guinea.

35. *C. filipendulus* Becc.—*Sheathed stem* 1–1·5 cm. in diam. *Leaf-sheaths* armed with short, or 5–10 mm. long or subtuberculiform, scattered or slightly confluent spines. *Leaves* ·5–1 m. long; the petiole short or long. *Leaflets* very few, 5–8 in all, elongate oblong, 25–40 cm. long, 5–10 cm. broad, 5–9-costate, naked on both surfaces, those of the terminal pair confluent by their bases. *Male* and *female spadices* similar, simply decompound, filiform, very long (1–1·8 m.). *Fruit* small, about 12 mm. long, broadly conical-ovate.

Malayan Peninsula.

36. *C. gonospermus* Becc.—*Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* densely armed with straight, spreading spines. *Leaves* about 50 cm. long, the petiole short. *Leaflets* very few, 6 in all, oblong or spathulate-oblong, 20–22 cm. long, 4·5–5·5 cm. broad, 5-costate, quite naked on both surfaces, those of the terminal pair about as large as the side ones, highly connate. *Female spadix* with a comparatively rigid and stout axis and with abbreviate, densely flowered partial inflorescences. *Fruit*

20–23 mm. long, blackish, shining, globose, ventricose and conically acute. *Seed* angular.

Borneo.

37. *C. floribundus* Griff.—Not very highly scandent. *Sheathed stem* 2–2·5 cm. in diam. or smaller. *Leaf-sheaths* densely armed with very unequal, short and long subulate spines. *Ocrea* densely bristly-hispid. *Leaves* comparatively short (·6–1 m.); the petiole rather long and robust, armed with straight, often long spines; rachis irregularly armed with a few, strong and long, solitary, suddenly deflexed spines. *flets* few, 6–10 on each side at most, very inequidistant, more or less approximate in groups of 2–3 on each side, narrowly lanceolate, 3-sub-5-costulate, the costæ (3 or 5) bristly spinulous above, beneath the mid-costa and the side costæ occasionally bristly, the two terminal leaflets larger than the others, highly connate. *Male spadix* ultra-decompound, elongate. *Female spadix* simply decompound with few partial inflorescences; primary spathes elongate, tubular, closely sheathing, often longitudinally split and open in their terminal portion on the ventral side. *Fruiting perianth* explanate. *Fruit* subsphæric, 9–10 mm. in diam.

North-East India.

C. floribundus var. ***depauperatus*** Becc.—Subscandent, small and delicate. *Sheathed stem* 5–6 mm. in diam. *Ocrea* densely hispid. *Leaves* small, with very few leaflets (6–8 in all); petiole and rachis armed only with very small scattered claws.

Assam: North-East India.

38. *C. interruptus* Becc.—Scandent. *Sheathed stem* 15–20 mm. in diam. *Leaf-sheaths* gradually passing into the petiole, armed with a few strong, scattered, broad-based 15–20 mm. long, straight and subulate spines. *Leaves* 1·5 m. long; the petiole rather long, deeply channelled above. *Leaflets* about 15 on each side in 4–5 distant fascicles of 2–3 on each side, narrowly lanceolate, 25–35 cm. long, 2·5–3 cm. broad unicostate with 2–3 secondary nerves on each side of the mid-costa, smooth also at the margins, those of the terminal pair somewhat shorter than the others and rather highly connate.

N. W. New Guinea.

C. interruptus var. ***docilis*** Becc.—*Leaf-sheaths* totally unarmed.

N. W. New Guinea.

39. *C. dioicus* Lour.—Scandent, very slender. *Sheathed stem* 4–5 mm. in diam. *Leaf-sheaths* hispid near the mouth, densely beset with very unequal, slender, straight spines. *Leaves* short, 25–40 cm. long; the petiole almost obsolete. *Leaflets* very inequidistant, more or less distinctly grouped, 8–11 in all, of which 4 are much approximate at the apex and 4 at the base, linear-lanceolate, 10–20 cm. long, 11–15 mm. broad, with 3 and sometimes 2 additional slender costæ, all bristly above, naked beneath; the two terminal leaflets free at the base. *Female spadix* very slender, filiform. *Fruiting perianth* shortly but distinctly pedicelliform. *Fruit* globular 9 mm. long, 8–8·5 mm. broad, with a small cylindric beak.

Cochin-China.

40. ***C. schistoacanthus*** Bl.—*Sheathed stem* about 10 mm. thick. *Leaf-sheaths* densely armed with short, or 2–3 cm. long, schistaceous, spreading, straight spines. *Leaves* 40–60 cm. long; petiole almost obsolete. *Leaflets* few, 6–7 on each side, linear-ensiform, unicostate, all naked on both surfaces, sprinkled beneath with very small scales, the intermediate ones largest, 15–30 cm. long, 10–12 mm. broad, these alternate; the basal pair of leaflets opposite, 4 at the apex approximate; those of the terminal pair quite free at the base.

Sumatra.

41. ***C. Kingianus*** Becc.—*Sheathed stem* 10–12 mm. in diam. *Leaf-sheaths* densely armed with short horizontal straight spines. *Ocrea*i nconspicuous. *Leaves*, including the petiole, about 70 cm. long; petiole 16 cm. in length and armed with small solitary claws. *Leaflets* very few (12 in all), distinctly grouped with long vacant spaces interposed, 3–sub-5-costulate, the 3 largest costæ spinulous on the upper surface, beneath all naked; the two terminal leaflets not larger than the others, 26 cm. long, 3 cm. broad, free at the base. *Male spadix* elongate, simply decompound; primary spathes narrow, very closely sheathing, entire; partial inflorescences terminating in a spikelet, this longer than the side ones, which are horizontal or deflexed, 8–9 cm. long, with remote flowers (20–22 on each side).

N. E. India: Assam.

42. ***C. Muellerii*** H. Wendl.—Slender. *Sheathed stem* 6–8 mm. in diam. *Leaf-sheaths* entirely covered with long, brown, rigid bristles. *Leaves* short, about 30 cm. long; the petiole almost obsolete. *Leaflets* few (11–14 in all) very inequidistant, lanceolate or linear-lanceolate, 3–sub-5-costulate, naked on both surfaces or sometimes with the mid-costa provided near the base on the upper surface with 1–4 long spiculæ, 18–20 cm. long at most, 16–24 mm. broad, those of the terminal pair free or slightly connate at the base. *Female spadix* filiform. *Fruiting perianth* explanate. *Fruit* broadly ovate or subglobose, shortly beaked, about 15 mm. long, 12 mm. broad.

N. E. Australia.

43. ***C. caryotoides*** All. Cunn.—Slender. *Sheathd estem* 5–8 mm. in diam. *Leaf-sheaths* armed with deciduous hair-like spiculæ. *Ocrea* densely hispid. *Leaves* short, 25–40 cm. long; petiole almost obsolete. *Leaflets* very few (6–9 in all), very inequidistant; side-leaflets alternate, elongate-cuneate or oblong-spathulate, more or less truncate and præmorse at the apex, those of the terminal pair very highly, sometimes completely connate, forming a cuneate flabellum which is truncate and præmorse on the terminal margin. *Male* and *female spadices* filiform, elongate. *Fruiting perianth* not pedicelliform. *Fruit* broadly ovate or subsphæric, shortly beaked, 12–13 mm. long, 9–10 mm. broad. *Scales* in 18 series.

Australia: Queensland.

44. ***C. viminalis*** Willd.—Scandent. *Sheathed stem* 2–3 cm. in diam., more or less armed with laminar broad-based spines. *Leaves* 1–1·25 m. long; the petiole very short; rachis armed beneath with 1–4 cm. long, straight, solitary or often ternate, usually deflexed spines, the centre ones often longer than the side ones. *Leaflets* numerous, narrowly lanceolate, 15–30 cm. long, 1–1·5 cm. broad, very distinctly fascicled and usually, at least in the intermediate part of the leaf, pointing in different ways, often many of those near the apex subequidistant. *Male spadix* simply decompound or rudimentarily supra-decompound, the spikelets bearing at each spathel a glomerule of flowers or very short and subscorpioid secondary spikelets which are composed of 4–8 flowers. *Female spadix* about 2 m. long, including a terminal flagellum; spikelets slender. *Fruiting perianth* explanate. *Fruit* pisiform, 8–9 mm. in diam. *Scales* in 15 series, channelled along the middle.

Java.

C. viminalis var. ***fasciculatus*** (Roxb.) Becc.—*Leaflets* distinctly fascicled and all pointing different ways, except a very few of the apical.

C. viminalis var. ***fasciculatus*** sub-var. ***bengalensis*** Becc.—*Fruit* slightly turbinate, 8 mm. in diam. *Scales* in 16-18 series.

Bengal and Burma.

C. viminalis var. ***fasciculatus*** sub-var. ***pinangianus*** Becc.—More robust than sub-var. *bengalensis*. *Male spikelets* as much as 20 cm. long, with distinct secondary spikelets bearing 2 series of as many as 8 flowers each.

Pulo Penang.

C. viminalis var. ***fasciculatus*** sub-var. ***andamanicus*** Becc.—Robust. *Leaf-sheaths* slightly armed. *Fruit* sphercial, 8·5–9 mm. in diam. *Scales* in 20 series.

Andamans.

45. C. siamensis Becc.—*Sheathed stem* 17 mm. in diam. *Leaf-sheaths* armed with laminar elongate spines. *Leaves* with a very short petiole; rachis armed beneath with straight and hooked spines. *Leaflets* more than forty on each side, very closely set in one plane and equidistant, narrowly lanceolate, unicostate, the intermediate ones 15–16 cm. long, 12–13 mm. broad. *Female spadix* elongate (as in *C. fasciculatus*) the largest spikelets 8–9 cm. long, with about 30 spathes. *Female flowers* numerous, very closely set and very conspicuously 4-seriate, two flowers equally developed and fertile issuing from each spathel, with a sterile flower between the two. Very similar in other respects to *C. fasciculatus*.

46. C. concinnus Mart.—Scandent, of moderate size. *Leaf-rachis* armed beneath with rather long, straight, deflexed spines. *Leaflets* numerous, distinctly fascicled, ensiform or lanceolate-ensiform, unicostate, with 3–4 rather distinct secondary nerves on each side of the mid-costa. *Male spadix* ultra-supra-decompound; primary spathes elongate-tubular; secondary spathes infundibuliform, subscarious, loosely sheathing. *Fruiting perianth* explanate. *Female spadix* simply decompound; spikelets 8–12 cm. long, with 18–20 distichous flowers on each side. *Fruits* small, globose, 8–9 mm. in diam. *Scales* in 18 series, deeply channelled along the middle.

Tenasserim.

47. ***C. mollis*** Blanco.—Scandent, slender. *Leaf-sheaths* sparingly spinous, densely hairy, brittle at the mouth. *Ocrea* spinulose. *Leaves* 40–60 cm. long; the petiole very short. *Leaflets* narrowly lanceolate, not very numerous, inequidistant, but not fascicled, unicostate or sub-3-costulate, the mesial ones 20–27 cm. long, 2 cm. broad. *Male spadix* flagelliform, ultra-decompound; spikelets with very closely packed spathels. *Female spadix* simply decompound, elongate; primary spathes as in the male spadix, elongate, closely sheathing, armed with many recurved prickles; spikelets short, 2·5–4 cm. long, with 12–18 distichous, very crowded flowers on each side; spathels very closely packed, bracteiform. *Fruiting perianth* explanate. *Fruit* small, sub-obovate-elliptic, abruptly beaked, 1 cm. long including the beak.

Philippines.

48. ***C. Meyenianus*** Schauer.—Like *C. mollis*, but *leaf-sheaths* and *primary spathes* quite smooth. *Ocrea* naked.

Philippines.

49. ***C. Blancoi*** Kunth.—Scandent, very slender. *Sheathed stem* 5–7 mm. in diam. *Leaf-sheaths* armed with needle-like almost bristly spines, the mouth truncate and hairy-bristly. *Leaves* 35–40 cm. long; the petiole very short. *Leaflets* few (14–17 in all), very inequidistant but not distinctly fascicled, linear or narrowly linear-lanceolate, subulately acuminate, 25–30 cm. long, 7–12 mm. broad, their mid-costa spinulous on both surfaces; side-nerves very slender; the two terminal leaflets free at the base. *Male spadix* slender, partially ultra-decompound; primary spathes elongate, hairy-bristly at the mouth, aculeolate; spikelets short, 10–15 mm. long; spathels bracteiform, concave. *Female spadix* simply decompound; spikelets few, short, 10–12 mm. long; spathels shortly and broadly infundibuliform. *Fruiting perianth* not pedicelliform.

Philippines.

50. ***C. rivalis*** Thw.—Scandent: more or less rusty-furfuraceous in the different parts and especially on the flowers, involucra and spathels. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* with straight, scattered, subulate spines. *Leaves* about 1 m. long; the petiole short. *Leaflets* numerous, rather approximate, equidistant, linear-lanceolate or ensiform, 3-costate, the mid-costa with a few long bristles beneath; the leaflets near the base the largest, 40–45 cm. long, 15–20 mm. broad. *Male spadix* elongate, partially ultra-decompound. *Female spadix* also elongate and flagelliform, simply decompound; partial inflorescences 20–30 cm. long, with 5–10 spikelets on each side; the largest spikelets 5–6 cm. long with 8–10 flowers on each side. *Fruiting perianth* not pedicelliform. *Fruit* small, very broadly ovoid, abruptly beaked, 11 mm. long including the beak, 7–8 mm. broad. *Scales* in 18 series, not or very faintly channelled along the middle.

Ceylon.

51. ***C. Metzianus*** Schl.—Dimensions of *leaf-sheaths* and *leaves* as in *C. rivalis*. *Fruit* broadly ovoid, very distinctly and abruptly contracted into an about 3 mm. long beak, 17 mm. long including the beak and perianth, 11 mm. broad. *Scales* distinctly channelled along the middle.

Lower India: Canara.

52. *C. pseudo-rivalis* Becc.—Apparently scandent and of moderate size. *Female spadix* very elongate, flagelliform, the clawed flagellum itself even 2 m. long; primary spathes very elongate, cylindraceous, often longitudinally split, more or less prickly; partial inflorescences slender, as much as 1 m. in length, with 10–12 spikelets on each side; secondary spathes elongate, cylindraceous. *Spikelets* 8–10 cm. long, with 18–20 distichous flowers on each side. *Fruiting perianth* not pedicelliform. *Fruit* small, ovate, rounded at both ends, abruptly contracted into a cylindric 2 mm. long beak, 14–15 mm. long including the beak, 9 mm. broad. *Scales* in 21 series, faintly channelled along the middle.

Nicobar Islands.

53. *C. pseudo-tenuis* Becc.—Scandent. *Sheathed stem* as thick as a finger. *Leaf-sheaths* armed with short or long straight subulate spines. *Ocrea* sometimes as much as 10 cm. long. *Leaves* with a petiole about 15 cm. long; rachis armed beneath with straight spines in its lower part and with long-tipped claws upwards. *Leaflets* numerous, equidistant, narrowly or linear-lanceolate, those near the base the largest, 35–45 cm. long, 2 cm. broad, with 3 bristly spinulous costæ above. *Male spadix* very long, flagelliform, supra-decompound; compound spikes 12–14 cm. long, with 12–15 very small, 10–15 mm. long, scorpioid few-flowered secondary spikelets on each side. *Female spadix* simply decompound; partial inflorescences very long (up to 90 cm.), with many slender flexuous spikelets on each side. *Fruiting perianth* explanate. *Fruit* small, ovoid or subobovoid, abruptly conically beaked, 10 mm. long, 7 mm. broad. *Scales* in 18 series, not channelled along the middle, straw-yellow with a broad very dark intramarginal line.

Ceylon and Lower India.

54. *C. Hookerianus* Becc.—Apparently high scandent and slender, or of moderate size. *Leaflets* numerous, equidistant, narrowly linear-ensiform, with 3 bristly costæ above; the largest 30 cm. long, 13 mm. broad. *Female spadix* very long and slender, flagelliform; primary spathes very long, very closely sheathing; partial inflorescences excessively long (up to 1·5 m.) with many remote spikelets on each side; these filiform, rigid, zig-zag sinuous, with rather remote flowers and pushed downwards by a very conspicuous axillary callus. *Fruiting perianth* callous at the base.

Lower India.

55. *C. nematospadix* Becc.—Scandent. *Sheathed stem* 12–15 mm. in diam. *Leaf-sheaths* armed with flat, fringed, elongate-triangular, 5–7 cm. long spines. *Leaves* 80–90 cm. long; the petiole rather long. *Leaflets* rather numerous, equidistant, linear ensiform, 20–30 cm. long, 1–2 cm. broad, sub-3-costulate. *Male* and *female spadices* very long, filiform, excessively slender; primary spathes very long, extremely narrow, and closely sheathing; male partial inflorescences elongate, with many filiform compound spikes; spikelets very short. *Male flowers* 2 mm. long. *Female spikelets* filiform, 4–5 cm. long. *Female flowers* 1·5–2 mm. long. *Fruiting perianth* explanate. *Fruit* pisiform, sphæric, minutely mucronate, 6–7 mm. in diam. *Scales* in 12 series.

Borneo: Sarawak.

56. C. australis Mart.—Scandent. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* completely covered with criniform spicules. *Leaves* about 60 cm. long, the petiole 4–5 cm. long, flattish above. *Leaflets* 10–18 on each side, slightly inequidistant, lanceolate or narrowly lanceolate, 15–27 cm. long, 20-28 mm. broad, unicostate, all nerves on both surfaces and margins naked. *Male spadix* elongate, flagelliform, ultra-decompound; primary spathes very elongate; spikelets with numerous flatly bifarious flowers. *Female spadix* simply decompound, as much as 2 m. long, including a slender aculeolate flagellum; partial inflorescences 25–30 cm. long, with 8–12 spikelets on each side; these 5–19 cm. long, vermicular, flexuous, with 8–14 flowers on each side. *Fruiting perianth* explanate. *Fruit* subsphæric, about 14 mm. in diam. *Scales* slightly channelled along the middle.

Australia: N. E. Queensland.

57. C. Moti Bailey.—Scandent. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* densely armed with subseriate spreading acicular spines. *Leaves* as much as 1·8 m. long; petiole cylindraceous, about 20 cm. long. *Leaflets* very numerous, equidistant, elongate-lanceolate or ensiform, 40–45 cm. long, 20–2 mm. broad, with 3 slender bristly costæ above, naked beneath, margins spinulous. *Female spadix* simply decompound, terminating in a very long and robust strongly clawed flagellum; partial inflorescence elongate, with many spikelets on each side; spikelets 5–6 cm. long, with 5–6 flowers on each side. *Fruiting perianth* not pedicelliform. *Fruit* subsphæric, about 12 mm. in diam., strongly beaked. *Scales* slightly channelled along the middle.

Australia: N. E. Queensland.

58. C. radicalis H. Wendl.—Scandent, of moderate size. *Leaves* rather large; rachis in the intermediate portion flattish beneath where it is armed along the middle with small solitary claws, bifaced above with an acute and spinulous angle. *Leaflets* numerous, equidistant, very narrowly or elongate-lanceolate, 45 cm. long, 20–22 mm. broad, sub-3-costulate mainly near the base; the 3 costulæ with long bristles above, and very inconspicuously spinulous beneath; margins appressedly spinulous.

Australia: N, E. Queensland.

59. C. zebrinus Becc.—Scandent. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* ornamented with very many, crowded, subannular, interrupted, lamelliform ridges, which are finely spinulous on their crest. *Ocrea* deciduous. *Leaves* about 1·7 m. long; the petiole 81 cm, long, flat above. *Leaflets* very numerous, closely set, equidistant, very narrowly linear, 25–30 cm. long, 1 cm. broad, 3-costulate, the costulæ rather closely and minutely bristly on both surfaces; margins very finely ciliolate.

N. E. New Guinea.

60. C. serrulatus Becc.—Scandent. *Sheathed stem* as thick as a finger. *Leaf-sheaths* slightly clavate, armed with not many straight scattered subulate spines. *Leaves* about 1·9 m. long; the petiole long (30 cm.), channelled above. *Leaflets* numerous, closely set, equidistant, shining on both surfaces, narrowly linear, 15–16 cm. long, 8–10 mm. broad; the mid-costa spinulous on both surfaces, and having on each side a very slender nerve which is remotely bristly above and naked beneath; margins very finely and closely spinulous-serrate.

N. W. New Guinea.

61. C. *Reinwardtii* Mart.—Scandent. *Sheathed stem* 1·5–2·5 cm. in diam. *Leaf-sheaths* beset with unequal, short or long, scattered subulate spines. *Leaves*, including the petiole, 1–1·5 m. long, petiole 10–25 cm. long, armed with long straight or sometimes hooked spines; rachis armed beneath with solitary, often long-tipped claws and long solitary straight deflexed spines, which are light coloured as are those of the leaf-sheaths. *Leaflets* rather numerous, subequidistant, linear-ensiform, distinctly 3-costate, the 3 costæ spinulous above; beneath only the mid-costa spinulous. *Male spadix* elongate-flagelliform; primary spathes elongate; partial inflorescences 20–35 cm. long; spathels shortly infundibuliform, acute. *Female spadix* simply decompound; elongate, with not many remote partial inflorescences; spikelets 7–13 cm. long, with 14–30 horizontally bifarious flowers on each side; spathels (as in the male spikelets) strongly veined. *Fruiting perianth* callous at the base and shortly pedicelliform, not or indistinctly striately veined. *Fruit* subglobular, 10 mm. in diam., suddenly contracted into a rather long beak. *Scales* in 15 series, very slightly channelled along the middle and with a rather acute triangular point.

Java.

62. C. *heteroideus* Bl.—Scandent, slender. *Sheathed stem* 1–1·5 cm. in diam. more or less armed with subulate light coloured spines. *Leaves* 50–90 cm. long; petiole rather elongate; rachis armed beneath with a few long straight deflexed spines and with long-tipped claws. *Leaflets* linear-ensiform, 3-costate; the 3 costæ spinulous above; underneath that of the centre sparingly spinulous or glabrous as are the side ones. *Male spadix* slender, elongate-flagelliform, partially supra-decompound, with not many very remote partial inflorescences; spathels shortly infundibuliform, prolonged at one side into a ciliate, elongate, spreading point. *Female spadix* simply decompound; spikelets; 3–5 cm. long. *Fruiting perianth* shortly pedicelliform, coarsely striately veined. *Fruit* ellipsoid, beaked, 12–14 mm. long, 9 mm. in diam. *Scales* in 18–19 series, obtuse.

Java.

C. *heteroideus* var. *depauperatus* Becc.—Very slender, almost unarmed. *Leaves* with smooth petiole and rachis. *Leaflets* entirely devoid of spinules beneath.

Java.

C. *heteroideus* var. *pallens* (Bl.) Becc.—Slender, sparingly armed, otherwise as in the type. *Leaflets* minutely and closely spinulous on the mid-costa beneath. *Male spadix* very elongate, diffuse.

Java.

63. C. *opacus* Bl.—Scandent. *Sheathed stem* about 1 cm. in diam. *Leaf-sheaths* armed with unequal, straight, subulate, scattered spines. *Leaflets* numerous, almost equidistant, linear-ensiform, the intermediate ones 25 cm. long, 13–16 mm. broad, with 3 bristly costæ above, the bristles confined to the mid-costa beneath. *Female spadix*

elongate-flagelliform; primary spathes very narrow, very closely sheathing; partial inflorescences elongate, with many spikelets on each side; spikelets inserted just at the mouth of their own spathe with a distinct axillary callus, 6–7 cm. long; spathels infundibuliform, 4 mm. long, truncate, smooth. *Fruiting perianth* very shortly pedicelliform. *Fruit* broadly ellipsoid, 17–18 mm. long, 13–14 mm. in diam. suddenly and shortly beaked. *Scales* faintly channelled along the middle.

Sumatra.

64. *C. luridus* Becc.—Scandent. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* densely armed with straight, scattered, laminar, subulate, rather short, setaceous spines. *Leaves* about 1 m. long; petiole 10–15 cm. long, flattish above, prickly at the margins. *Leaflets* not very numerous, rather remote, equidistant, ensiform, the intermediate ones 35–40 cm. long, 1·5–3·5 cm. broad, with 3 costæ which are bristly above and naked beneath. *Female spadix* more or less supra-decompound, very long, flagelliform, with very remote monœcious (always?) partial inflorescences; spikelets of the lower part of the inflorescences bearing female flowers accompanied as usual by a neuter one, while the spikelets of the summit or some of the secondary ones bear male flowers only; primary spathes elongate, strongly clawed chiefly on the outer side. *Male flowers* oblong, 4·5 mm. long. *Fruiting perianth* shortly pedicelliform. *Fruit* broadly obovoid, very suddenly and distinctly beaked, 11 mm. long, 8 mm. broad. *Scales* in 15–16 series faintly channelled along the middle.

The Malayan Peninsula.

65. *C. sabensis* Becc.—Scandent, slender. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* armed with scattered, horizontal spines. *Leaves* about 60 cm. long, the petiole very short; rachis armed with very small, scattered claws. *Leaflets* very few, inequidistant, lanceolate, 30–32 cm. long, 28–34 mm. broad, concolorous, 3-sub-5-costulate, the costæ quite devoid of either spines or bristles on both surfaces; the margins appressedly spinulose. *Female spadix* slender, very elongate, flagelliform; primary spathes narrow, elongate, densely prickly near their summit; partial inflorescences very elongate with many remote spikelets; secondary spathes subclavate, 4–5 cm. long, armed with small hooked prickles; spikelets spreading, 5–5·5 cm. long, spathels finely veined, subscabrid. *Fruiting perianth* distinctly pedicelliform. *Fruit* ovoid-elliptic, beaked, 12 mm. long, 8 mm. broad. *Scales* in 18 series, not channelled along the middle, brownish with a narrow, very dark margin. *Seed* broadly pitted.

66. *C. delicatulus* Thw.—Scandent. *Sheathing stem* 18–20 mm. in diam. *Leaf-sheaths* armed with subulate spines, which are very long near the mouth. *Leaves* ·7–1 m. long. *Leaflets* numerous, equidistant, linear-ensiform, the intermediate ones 25–28 cm. long, 12–15 mm. broad, unicostate; the costa and one slender nerve on each side of it bristly spinulose above; beneath only the mid-costa furnished with a few long bristles. *Spadices* filiform and very long and excessively slender. *Male* and *female flowers* horizontal, 3–4 mm. apart. *Fruit* small, globose, 8–10 mm. in diam. *Scales* in 15 series, shining. *Seed* facetted.

Ceylon.

67. *C. Helferianus* Kurz.—Seemingly scandent and slender. *Leaf-rachis* acutely bifaced on its upper surface, slightly clawed beneath. *Leaflets* rather numerous, very distinctly grouped 2–5 on each side, equidistant and disposed on one plane in each group (not pointing different ways), with long vacant spaces interposed; the intermediate ones linear-lanceolate, 20–30 cm. long, 13–15 mm. broad, sub-5-costulate, the 3 central costæ spinulose above and smooth beneath. *Male* and *female spadices* very long and slender; primary spathes very narrow and long and very closely sheathing; flowers (♂ and ♀) horizontally inserted; male flowers 1·5–2 mm. apart, oblong, 4 mm. long; female flowers broadly conic, 4 mm. long, 5–7 mm. apart.

Tenasserim

68. *C. nicobaricus* Becc.—Scandent. *Sheathed stem* 7–14 mm. in diam. *Leaf-sheaths* armed with numerous very unequal rather broadly laminar sometimes very long elastic light-coloured spines. *Leaves* 60–90 cm. long; petiole rather short. *Leaflets* numerous, equidistant, linear, subulately acuminate, unicostate; the mid-costa bristly spinulous on both surfaces, side-nerves very slender, smooth, the intermediate leaflets 18–25 cm. long, 10–12 mm. broad.

Nicobars.

69. *C. myriacanthus* Becc.—Not scandent (?). *Sheathed stem* about 4 cm. in diam. *Leaf-sheaths* not gibbous above, open on the ventral side, gradually passing into the petiole, entirely covered with very numerous almost equally distributed small short acicular horizontal spines. *Leaves* 2·5 m. long, the petiole very long. *Leaflets* subopposite at first, alternate and speedily decreasing in size towards the apex, oblanceolate, somewhat concavo-convex, broadest above the middle, green on the upper surface, conspicuously paler beneath with 7–8 main-nerves which are glabrous on both surfaces, the largest leaflets 40 cm. long, 7–7·5 cm. broad; the two of the terminal pair free at the base. *Female spadix* simply decompound, flagelliform with an excessively long peduncular part; partial inflorescences up to 80 cm. long with numerous spikelets on each side; spikelets slender, as much as 15 cm. long with 28–30 flowers on each side; spathels bracteiform very approximate; involucrophorum scale-like; involucre attached almost outside its own spathel at the base of the one above, explanate and formed by two triangular strongly veined bracts.

Borneo.

70. *C. pygmaeus* Becc.—Almost stemless, very delicate. *Leaf-sheaths* not flagelliferous, prickly, opened upwards on the ventral side and gradually passing into the petiole. *Leaves* 45–50 cm. long, including a rather long subterete petiole. *Leaflets* numerous, very closely equidistant, linear-lanceolate, very small, 10–12 mm. long, 6–8 mm. broad, the two terminal quite free. *Male* and *female spadices* excessively long and slender, with very few partial inflorescences; primary spathes very narrow and closely sheathing; female spikelets filiform, zig-zag sinuous, 1·5–3 cm. long. *Fruiting perianth* not pedicelliform, but the calyx callous at the base. *Fruit* very small, broadly ovate and conically beaked. *Scales* in 12 series.

Borneo: Sarawak.

71. *C. barbatus* Zipp.—Scandent. *Sheathed stem* as thick as a finger. *Leaf-sheaths* gradually passing into the petiole, furnished with rigid bristles at the margins

of the elongate mouth and armed on its surface with straight scattered subulate spines. *Ocrea* short liguliform. *Leaves* about 1 m. long; petiole 4–7 cm. long. *Leaflets* numerous, inequidistant, or more or less distinctly grouped, narrowly lanceolate, 10–18 cm. long, 1 cm. broad, with 3 costæ which are provided with few strong bristles above and are naked beneath. *Female spadix* simply decompound, rigid, short, primary spathes densely bristly bearded at the mouth. *Fruiting perianth* not pedicelliform; the calyx slightly callous at the base. *Fruit* obovate, about 18 mm. long, 11-12 mm. broad, conically beaked. *Scales* slightly channelled along the middle.

Southern New Guinea.

72. **C. vestitus** Becc.—Scandent. *Sheathed stem* 12–15 mm. in diam. *Leaf-sheath* densely armed with small delicate almost bristly spines. *Ocrea* 15–18 cm. long, dry, ultimately lacerate and fibrous. *Leaves* about 60 cm. long, petiole very short or 0. *Leaflets* numerous, equidistant, linear-acuminate, the intermediate ones 20 cm. long, 10–12 mm. broad, 3-costulate, with long bristles on all three costæ above and only on the mid-costa beneath; the two terminal leaflets small, free at the base. *Male* and *female spadices* elongate, flagelliform, longer than the leaves. *Male spadix* ultra-decompound with not many, remote, elongate partial inflorescences. *Female spadix* simply decompound; spikelets vermicular, slender, 6–9 cm. long, with 5–10 remote flowers on each side.

Northern New Guinea.

73. **C. ralumensis** Warb.—Scandent. *Sheathed stem* 2·5–3 cm. in diam. *Leaf-sheath* unarmed or nearly so. *Ocrea* very large, 15–30 cm. long, lanceolate-auriculiform, papyraceous, not breaking into filaments. *Leaves* above 1 m. in length; petiole very short or 0. *Leaflets* numerous, equidistant, ensiform or narrowly lanceolate-ensiform, the intermediate ones 30–40 cm. long, 20–25 mm. broad, 3-costulate, with long bristles on the 3 costæ above, beneath the mid-costa only bristly spinulous. *Spadices* longer than the leaves, flagelliform; primary spathes tubular, closely sheathing, marcescent and fibrous at the mouth. *Male spadix* ultra-decompound. *Female spadix* terminating in a filiform clawed flagellum; upper primary spathes often split on the ventral side; partial inflorescences 30–40 cm. long, with 8–9 spikelets on each side; these 10–15 cm. long. *Fruiting perianth* shortly pedicelliform. *Fruit* spherical (when ripe) about 1 cm. in diam. *Scales* in 15 series, faintly channelled along the middle.

Eastern New Guinea.

74. **C. macrochlamys** Becc.—Apparently scandent. *Sheathed stem* 2 cm. in diam. *Leaf-sheaths* smooth. *Ocrea* very large, as much as 35 cm. long, lanceolate-auriculiform, exsuccous, papyraceous, seriately spinulous at the base and near the margins. *Leaves* about 90 cm. long; petiole 11–12 cm. long. *Leaflets* not numerous, distinctly grouped with long vacant spaces interposed, lanceolate or oblanceolate, 25–30 cm. long, 4–5 cm. broad, unicostate, quite naked on both surfaces, the margins also smooth except near the apex, the two of the terminal pair confluent to the middle and forming a forked flabellum. *Male spadix* shorter than the leaves, densely panicled, cupressiform; spikelets short; 2–3 cm. long with 13–15 flatly bifarious and pectinately arranged flowers on each side.

Eastern New Guinea.

75. C. gogolensis Becc.—Scandent. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* armed with scattered unequal subtuberculiform or laminar spines as much as 15–20 mm. long. *Ocrea* 8–10 cm. long, dry and ultimately fibrous, obtuse. *Leaves* about 1 m. long; petiole 12 cm. long (in one specimen). *Leaflets* not very numerous, conspicuously grouped in fascicles of 2–3 on each side, with long vacant spaces interposed, ensiform or narrowly lanceolate-ensiform, 30–35 cm. long, 2–2·5 cm. broad, with 3 costæ which have a few bristles above; beneath the mid-costa only bristly spinulous near the apex; 4 leaflets are approximate at the summit, the two terminal confluent to the middle and somewhat shorter, but not narrower than the others.

Eastern New Guinea.

76. C. tenuis Roxb.—Scandent. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheath* more or less armed with very broad-based spines, which often form transverse crests by their confluent and extended bases. *Leaves* 60 cm.–1 m. long; petiole 10–15 cm. long. *Leaflets* 20–35 on each side, rather closely set, equidistant, linear-ensiform or very narrowly lanceolate, 15-35 cm. long, 15 mm. broad, tricostate; the 3 costæ bristly above, and beneath only the mid-costa sparingly spinulous; often the mid-costa provided at the base on its upper surface with a rigid spinule. *Male spadix* very long, ultradecompound; the largest spikelets 2–3 cm. long and with two series of 6–10 flowers, which resemble those of some species of *Digitaria*, are quite exsert from the involucres, 4 mm. long, oblong, and obsoletely trigonous. *Female spadix* simply decompound; partial inflorescences few, the upper ones very short, the lowest 15–20 cm. long with 7–10 arcuate spikelets on each side; flowers of young spikelets distinctly 4-seriate, each female flower being accompanied by a well-developed neuter flower. *Fruiting perianth* distinctly pedicelliform. *Fruit* globose, 10–11 mm. in diam. shortly acutely beaked. *Scales* in 15 series, narrowly channelled along the middle. *Seed* globose.

N. India, Burma; Cochin-China.

77. C. horrens Bl.—Scandent. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* armed with conspicuously broad-based, scattered, straight, subulate spines. *Leaves* about 1 m. long; petiole rather short, about 15 cm. long, flat and smooth above, convex and armed beneath along the middle with black-tipped, straight, slightly deflexed but not hooked spines, of which a few are 1–2 cm. long, and others much shorter. *Leaflets* numerous, equidistant, 3-costate, linear-ensiform or very narrowly lanceolate; the 3 costæ bristly above, beneath only the mid-costa sparsely bristly spinulous; almost all leaflets furnished on the mid-costa on the upper surface near the base with a rigid spinule.—Probably this is only a Javan form of *C. tenuis.*

Java.

78. C. Godefroyi Becc.—Scandent. *Sheathed stem* 15 mm. in diam. *Leaf-sheaths* armed with broad-based, black-tipped spines. *Leaves* about 60 cm. long, quite epetiolate. *Leaflets* 15–16 on each side, narrowly lanceolate, acuminate, with only a distinct sparingly spinulous costa above; those a little above the base (the largest) 30–35 cm. long, 2·5 cm. broad, the others speedily and gradually shorter, but not narrower, the two of the terminal pair (the smallest) free at the base. *Female spadix* strict, flagelliform, with very few remote small partial inflorescences; spikelets small, subscorpioid, with few slightly assurgent or not perfectly flatly bifarious flowers: involucrophorum and involucre flat, discoid, almost horizontally subtended by their own spathel. *Fruit* spherical, mammillate, about 12 mm. in diam.

Lower Cochin-China.

79. *C. Rotang* L.—Scandent. *Sheathed stem* 8–16 mm. in diam. *Leaf-sheaths* more or less armed with broad-based, straight, subulate spines. *Leaves* 40–80 cm. long; petiole very short or almost 0. *Leaflets* numerous, equi- or sub-equidistant, narrowly: or sublinear-lanceolate, unicostate, the costa bristly beneath, usually provided above with 1 or 2 robust spinules near its base and a few subspinous bristles on the remainder. *Male spadix* elongate, ultradecompound; spikelets subscorpioid, short, 12–25 mm. long at most, with 5–12 approximate flowers on each side. *Male flowers* subtrigonous-ovate, acute; the corolla divided almost to the base into 3 segments. *Female spadix* flagelliform; partial inflorescences 15–20 cm. long at most, and with 5–8 spikelets on each side, the upper ones shorter; spikelets strongly arcuate, 3–5 cm. long, with the neuter flower divaricate. *Fruiting perianth* pedicelliform. *Fruit* globose, 12–13 mm. broad, 13–15 mm. long, minutely apiculate. *Scales* in 21 series, faintly channelled along the middle. *Seed* flattened or sublenticular.

Ceylon and Lower India.

80. *C. Walkerii* Hance.—Apparently scandent and of moderate size. *Leaves* petiolate. *Leaflets* very numerous, equidistant, 22–24 mm. apart, ensiform, rather large, with 3 costæ, which are acute and bristly above and usually naked beneath; rachis armed beneath along the centre with black-tipped deflexed sometimes even 2 cm. long spines. *Female spadix* decompound, prolonged into a long clawed flagellum; primary spathes tubular, closely sheathing; partial inflorescences few, rather compact, pyramidal, the largest about 20 cm. long, with 18–20 approximate very regularly set and speedily shortening spikelets on each side; spikelets filiform, slightly arcuate, 6–7 cm. long at most, with 15–16 distichous flowers on each side. *Fruit* small, ovoid, apiculate, 12 mm. long. *Scales* in 18 series, not channelled along the middle. *Seed* flattened.

Hong-Kong.

81. *C. Faberii* Becc.—Apparently scandent and of moderate size. *Leaflets* very numerous, equidistant, rather approximate, linear-lanceolate, 3-costate, on the upper surface the 3 costæ, underneath only the central one, bristly; rachis armed (at least near the summit) with short solitary approximate claws. *Female spadix* elongate-flagelliform, clawed in its attenuated parts; primary spathes elongate, tubular, closely sheathing; partial inflorescences remote, rather many, pyramidal, 18–20 cm. long, with about 10 spikelets on each side; these speedily decreasing in length, the lower ones 5–6 cm. long with 12–13 flowers on each side; the uppermost very few-flowered. *Fruiting perianth* shortly pedicelliform; the corolla almost twice as long as the calyx. *Fruit* (immature) ovoid, small.

S. China.

82. *C. tonkinensis* Becc.—Not scandent, bushy. *Leaf-rachis* armed beneath with straight not hooked deflexed spines. *Leaflets* numerous, equidistant, 2·5 cm. apart, narrowly ensiform, the intermediate ones 30–32 cm. long, 18–19 mm. broad, very distinctly 3- and sometimes sub-5-costate; the mid-costa naked on both surfaces, one

nerve on each side of it sparingly bristly above and naked beneath. *Female spadix* partially supradecompound and apparently large; primary spathes tubular, closely sheathing; partial inflorescences panicled, with numerous spikelets, of which the lower ones are branched and the uppermost very short. *Fruiting perianth* shortly but distinctly pedicelliform. *Fruit* small, broadly ovate, mucronulate, 10–11 mm. long, 8 mm. broad. *Scales* shining, not channelled along the middle.

Tonkin.

83. *C. Delessertianus* Becc.—Probably scandent and of moderate size. *Leaflets* numerous, rather closely set and equidistant, elongate-ensiform, sub-5-costulate, the intermediate ones 32–35 cm. long, 20–22 mm. broad, the 3 main costæ furnished with bulbous bristles on the upper surface, underneath the mid-costa only bristly; the margins closely spinulous. *Female spadix* apparently large and elongate; upper primary spathes elongate, cylindraceous; partial inflorescences (in one specimen) 30 cm. long, with 13 distichous spikelets on each side; spikelets inserted just at the mouth of their respective spathes with a distinct axillary callus, the lower ones about 6 cm long, with 20 flowers on each side; involucrophorum not pedicellate; female flowers 3 mm. long; neuter flowers more slender, but as long as the female ones, their corolla twice as long as the calyx.

Lower India.

84. *C. Brandisii* Becc.—Scandent. *Sheathed stem* 10–15 mm. in diam. *Leaf-sheaths* armed with numerous acicular spines, the mouth and the ocrea furnished with numerous long bristly spiculæ. *Leaves* about 55 cm. long, the petiole (15 cm. long) armed like the rachis with long, solitary, straight, subulate, scattered and in the lower part of the rachis deflexed spines. *Leaflets* few, elongate-lanceolate, very inequidistant, a few of them approximate and digitate at the summit, almost all equal, 25–27 cm. long, 20–25 cm. broad, 1- or sub-3-costulate. *Female spadix* elongate, flagelliferous and aculeolate at the summit; larger partial inflorescences 15–20 cm. long, with 5–6 spikelets on each side.

Lower India.

85. *C. salicifolius* Becc.—Small and bushy. *Sheathed stem* 6–7 mm. in diam. *Leaf-sheaths* armed with not many short and rather long straight horizontal spines, and when not bearing a spadix provided with a very short rudimentary flagellum. *Leaves* small, 20–30 cm. long; petiole very short or 0. Leaflets few, subglaucescent elliptic-lanceolate, acute, 5–10 cm. long, 8–15 mm. broad, distinctly grouped into 5–6 fascicles with rather long vacant spaces interposed, the mid-costa above with 2–3 relatively long spines, otherwise naked on both surfaces; margins spinulous. *Female spadix* short, ultradecompound; female flowers accompanied by a well developed apparently fertile male flower. *Fruiting perianth* shortly pedicelliform. *Fruit* very small, globular, stoutly beaked, 8 mm. broad.

Cochin-China.

C. salicifolius var. *leiophyllus* Becc.—*Leaflets* almost without spines on the mid-costa, and with the margins smooth or nearly so.

Cochin-China.

86. *C. tetradactylus* Hance.—Slender. *Sheathed stem* 6–10 mm. in diam. *Leaf-sheaths* smooth or very scantily armed. *Leaves* small, about 45 cm. long; petiole very short. *Leaflets* few, usually paired on each side of the rachis, the pairs sub-opposite and forming 3–5 groups with long vacant spaces interposed, lanceolate-elliptic or oblong-lanceolate, 3-costulate, smooth on both surfaces. *Male spadix* ultra-decompound, arcuate. *Female spadix* simply decompound, ending in a slender clawed flagellum; the largest spikelets (the lowest) 4–5 cm. long with 5–6 remote flowers on each side; involucrophorum more or less distinctly pedicellate. *Fruiting perianth* distinctly pedicelliform. *Fruit* globose, 8–10 mm. in diam. *Scales* in 21–23 series faintly channelled along the middle.

Hong-Kong.

87. *C. acanthospathus* Griff.—Subscandent, rather robust. *Sheathed stem* 3–5 cm. in diam. *Leaf-sheaths* not very elongate, covered with small spiny tubercles or with broad-based, solitary or confluent and subseriate spines. *Leaves* large, as much as 1·5 m. long; petiole short. *Leaflets* large, as much as 45 cm. long, 5-6 cm. broad, many-costate and plicate, lanceolate, remote, inequidistant, never aggregate or paired. *Spadices* elongate, flagelliform; primary spathes coriaceous, elongate, closely sheathing, more or less armed with short conic prickles or almost smooth; larger female spikelets arcuate, sub-scorpioid, 5-7 cm. long with 10–14 flowers, which are disposed in two somewhat unilateral series. *Fruiting perianth* pedicelliform, thick and short. *Fruit* broadly ovoid, suddenly conically beaked, 24-25 mm. long, including the beak and the perianth 14–15 mm. broad. *Scales* subshining, in 15 series, cinnamon brown, superficially channelled along the middle. *Seed* deeply pitted on the back; albumen subruminate; embryo basal.

India: Sikkim Himalaya.

88. *C. Feanus* Becc.—Scandent. *Sheathed stem* 16-22 cm. in diam. *Leaf-sheaths* mottled, armed with irregular subdimidiate conic prickles. *Leaves* about 1 m. long, petiole very short or 0. *Leaflets* few (6–8 on each side), inequidistant, but not fascicled; rather remote, somewhat concavo-convex, elliptic-lanceolate or oblanceolate, many-costulate, the costæ inconspicuously spinulous above, naked beneath, 20–32 cm. long, 5–7 cm. broad. *Female spadix* flagelliform, elongate; primary spathes very elongate, entire, very closely sheathing, sparingly prickly; lower partial inflorescences (the largest) 10–14 cm. long with 3–4 scorpioid spikelets on each side; the flowers slightly pointing upwards. *Fruiting perianth* pedicelliform. *Fruit* broadly ovoid, suddenly, conically beaked, 17–18 mm. long, 12 mm. in diam. *Scales* in 15 series, opaque, not channelled along the middle. *Seed* deeply grooved on the back; albumen subruminate; embryo basal.

Tenasserim.

89. *C. bacularis* Becc.—*Stem* erect, about 2 cm. in diam. *Leaves* about 2 m. long. *Leaf-sheaths* armed with long spines, open on the ventral side and gradually passing into the petiole; this long and armed at the base with long horizontal spines; rachis smooth beneath. *Leaflets* equidistant, narrowly lanceolate, concolorous and shining on both surfaces, with 3 acute costæ which are spinulous above and smooth beneath. *Male* and *female spadices* erect unarmed; primary spathes tubular, rather loosely sheathing and split longitudinally above, smooth or occasionally

furnished with a few subspinous paleolæ on the apex. *Male flowers* cylindraceous, 4 mm. long. *Female flowers* elongate-conic, 4 mm. long. *Fruit* sphæric, 1 cm. in diam. with a cylindraceous beak.

Borneo.

90. C. perakensis Becc.—*Stem* short erect. *Leaf-sheaths* open on the ventral side, passing gradually into the petiole. *Leaves* 1–1·3 m. long; petiole rather long, armed at the sides with very long, sometimes as much as 6–7 cm., straight horizontal spines; rachis minutely prickly beneath. *Leaflets* numerous, equidistant, lanceolate-ensiform, 3-costate. *Male* and *female spadices* rigid, straight, not flagelliferous; primary spathes tubular at the base, bursting upwards and more or less expanded into an elongate, lanceolate, acuminate blade. *Male flowers* cylindraceous 4·5–5 mm. long. *Female flowers* perfectly bifarious, ovate-conical, 4 mm. long. *Fruit* with mahogany red scales.

The Malayan Peninsula.

91. C. ramosissimus Griff.—Erect or subscandent. *Leaf-sheaths* gradually passing into the petiole. *Leaves* 2–3 m. long, terminated by a single entire lanceolate leaflet; petiole 10–30 cm. long, armed lower down with straight robust spines and upwards with stout claws. *Leaflets* numerous, subequidistant, lanceolate, many-costulate, shining, concolorous. *Male* and *female spadices* relatively short, not flagelliform, rigid; primary spathes open, flat, broadly linear, overlapping each other. *Fruit* broadly ovoid or globose-ovoid, distinctly beaked, 13-14 mm. long, 8-10 mm. broad. *Scales* in 15 series, mahogany red.

The Malayan Peninsula.

92. C. paspalanthus Becc.—Scandent. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* conspicuously tumescent at the base of the petiole. *Leaves* rather large; petiole elongate. *Leaflets* numerous, equidistant, approximate, narrowly linear, with 3 acute costæ, which are sparsely bristly above and very minutely and closely ciliate beneath. *Male spadix* very elongate, flagelliform, with large and diffuse partial inflorescences; primary spathes very long, tubular at the base and reduced to long strands in their upper part; spikelets numerous, 1·5-2 cm. long, with 10–15 perfectly and closely bifarious, sub-horizontal flowers on each side; spathels and involucres boldly, striately veined. *Female spadix* very different from the male one, very long (as much as 3·5 m.); partial inflorescences kept spreading by a very large axillary callus; spikelets 10–12 cm. long with 15–20 flowers on each side, spathels smooth. *Fruit* broadly ovate, 18 mm. long. *Seed* flattened, suborbicular.

Borneo.

C. paspalanthus var. *peninsularis* Becc.—*Male spadix* with spathels not or indistinctly striately veined. *Female spadix* with spathels irregularly armed with very small claws.

The Malayan Peninsula.

93. C. Guruba Ham.—Scandent. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* gibbous above, usually armed with ascendent, obliquely inserted spines. *Leaves* usually 60–80 cm. long, sometimes as much as 1·3 m.; petiole 10–20 cm. long. *Leaflets* numerous, narrow, equidistant, subtricostate, concolorous on both surfaces. *Male* and *female spadices* flagelliform, up to 2–3 m. in length, with many remote partial inflorescences; primary spathes split longitudinally and then open, flat, broadly linear, longer than their respective partial inflorescence. *Fruiting perianth* shortly pedicelliform. *Fruit* very small, pisiform, 7 mm. in diam.

N. E. India.

94. Calamus nitidus Mart.—Slender. *Leaves* 60–70 cm. long. *Leaflets* lanceolate, closely equidistant, concolorous, on the upper surface the mid-costa and two slender nerves on each side of it bristly, beneath the mid-costa only spinulous. *Male* and *female spadices* very slender with many partial inflorescences and a very slender flagellum at their summit; primary spathes open and flat during the anthesis, broadly linear, somewhat longer than the inflorescences. *Fruiting perianth* shortly pedicelliform. *Fruit* very small.

Tenasserim.

95. C. platyspathus Mart.—Slender, scandent. *Leaf-sheaths* armed with subulate spines. *Leaves* short. *Leaflets* few, inequidistant, very remote, elongate-lanceolate, 25–30 cm. long, 20–30 mm. broad, with 5–6 rather acute costæ, of which the central naked and the others occasionally spinulous; the lower surface slightly mealy or pulverulent. *Male spadix* elongate, very slender, filiform, with few remote panicled partial inflorescences; primary spathes about as long as their respective inflorescence, open, flat, laminar, oblong, obtuse or subtruncate at the summit: the lowest (in one specimen) 10 cm. long, 13 mm. broad. *Male flowers* subterete, narrow.

Tenasserim.

96. C. myrianthus Becc.—Apparently scandent and of moderate size. *Leaves* apparently rather large. *Leaflets* large, elliptic-lanceolate, many-costate, 40–42 cm. long, 4–5 cm. broad, naked on both surfaces or very sparingly spinulous on the main costæ, green above, mealy-whitish beneath. *Male spadix* elongate, slender, with many remote panicled-pyramidate, 15–20 cm. long partial inflorescences; primary spathes apparently very narrow, elongate, lacerate; spikelets very delicate and small, the largest, 12–15 mm. long with 8–10 very small trigonous acuminate flowers on each side.

Tenasserim.

97. C. hypoleucus Kurz.—Apparently slender. *Sheathed stem* 7-8 mm. in diam. *Leaf-sheaths* armed with unequal, broad-based, subulate spines. *Ocrea* short, membranous, truncate. *Leaves* short (in one specimen 45 cm. long); petiole short; leaflets flaccid, papyraceous, few, very distinctly grouped with long vacant spaces interposed, elliptic or oblong lanceolate, 15–16 cm. long, 3–3·5 cm. broad, green above and white beneath, with 7–9 slender costæ, these naked on both surfaces. *Female spadix* very short and compact (15 cm. long in one specimen); primary spathes concave-cymbiform, elliptic, thinly papyraceous and exsuccous, imbricate, and similar to those of a *Dæmonorops* sect. *Cymbospathæ;* partial inflorescences small, shorter than their respective spathes; spikelets very small, the largest 12–15 mm. long, few-flowered and with a strongly zig-zag sinuous, slender axis; flowers 2 mm. long, ovate acute.

Burma.

98. C. leucotes Becc.—Apparently scandent. *Sheathed stem* 2 cm. in diam. *Leaf-sheaths* very densely armed with very inequal, small and large, ascendent spines. *Ocrea* short. *Leaves* rather robust and large; petiole robust and long. *Leaflets* few, grouped, with very long vacant spaces interposed, firmly papyraceous, lanceolate or elliptic-lanceolate, up to 40 cm. long and 5·5 cm. broad, plicate many costate, green above, covered with a crustaceous chalky coating beneath. *Male spadix* rather elongate, rigid, with a rather robust axis; partial inflorescences strict, cupressiform, much shorter than the primary spathes, these elongate, open, flat; male flowers 3 mm. long, acute.

Burma.

99. C. travancoricus Bedd.—Scandent. *Sheathed stem* 7–10 mm. in diam. *Leaf-sheaths* armed with slender, sometimes bristly spines. *Leaves* 40–50 cm. long; petiole 5–7 cm. long, rachis armed with slender claws. *Leaflets* narrowly oblanceolate, 15–18 cm. long, 10–15 mm. broad, finely 3-sub-5-costulate, 20–30 in all, distinctly approximate in fascicles of 3–5 on each side, all in one plane, and not pointing in different directions, the groups of one side opposite with those of the other side and 3–10 cm. apart. *Spadices* slender, elongate, with a slender aculeolate flagellum at their summit; primary spathes elongate, longer than the small partial inflorescences, enfolding these at first and then more or less bursting longitudinally. *Male spadix* ultradecompound; spikelets very small (7–8 mm. long) and delicate, with strongly zig-zag sinuous axis and 4–5 distichous flowers on each side. *Female-spadix* simply decompound; spikelets 12–15 mm. long at most, with 3–4 distant flowers on each side; involucrophorum shortly pedicelliform. *Fruit* globose, ovoid, mucronulate, 8–10 mm. long.

Lower India.

100. C. Rheedei Griff.—Scandent and apparently of moderate size. *Leaf-rachis* armed with rather robust claws. *Leaflets* pointing in different directions, distinctly approximate in pairs on each side, the pairs opposite and forming groups of 4, with long vacant spaces interposed, narrowly lanceolate, unicostate. *Fruit* ovoid or ellipsoid, about 2 cm. long, 12 mm. broad, shortly beaked.

Lower India.

101. C. Hugelianus Mart.—*Sheathed stem* about 3 cm. in diam. *Leaves* large; petiole stout, almost equally convex on both surfaces. *Leaflets* numerous equidistant, narrowly ensiform, up to 70 cm. long, subshining on both surfaces, with 3 distinct and more or less bristly costæ above, glabrous beneath or with a few bristles on the mid-costa; margins very distantly ciliolate-spinulous. *Female spadix* very long, terminating in an excessively long and robust clawed flagellum; primary spathes very elongate and closely sheathing, prickly all round in their upper part; spikelets arched. *Female flowers* 6 mm. long, pointing upwards. *Fruit* almost sphæric, 15–18 mm. in diam., very shortly beaked. *Scales* in 21 series, black, shining, not or very indistinctly channelled along the middle.

Lower India.

102. **C. Gamblei** Becc.—*Leaves* large. *Leaflets* 6–7 cm. apart, ensiform, 60–65 cm. long, 25–28 mm. broad, with 3, on both surfaces more or less bristly-spinulous costæ, margins remotely ciliate-spinulous. *Female spadix* with somewhat arched, 25–30 cm. long partial inflorescences; spikelets arched, subscorpioid. *Female flowers* pointing upwards, ovate, 5 mm. long. *Fruit* globose-obpyriform or turbinate-globose, tapering towards the base, 22–25 mm. long, 17–18 mm. broad. *Scales* usually in 21 series, pale yellow, shining, strongly gibbous, distinctly channelled. *Seed* globose ovoid.

Lower India.

C. Gamblei var. **sphærocarpus** Becc.—*Fruit* sphærical, not tapering to the base, 18 mm. in diam. *Seed* also almost sphærical.

Lower India.

103. **C. gracilis** Roxb.—Scandent. *Sheathed stem* 15–20 mm. in diam. *Leaves* rather short; petiole 1–3 cm. long. *Leaflets* few, all in one plane, approximate into 3–4, usually opposite and rather remote groups of 3–5 on each side of the rachis, narrowly oblanceolate or elliptic-lanceolate, with 3–5 and occasionally on the upper surface 7 spinulous costæ, underneath the mid-costa only sparingly spinulous. *Male* and *female spadices* relatively short, ending in a filiform, feebly-clawed flagellum. *Male flowers* relatively large, 5 mm. long, 2 mm. thick. *Female flowers* distant, horizontal. *Fruit* broadly ovoid-elliptic, 26–30 mm. long, 14–17 mm. broad; *scales* in 21 series, straw-yellowish, narrowly and deeply channelled along the middle. *Seed* ovoid, ruminated; embryo lateral, in the centre of one of the faces.

N. E. India.

104. **C. melanacanthus** Mart.—*Leaves* elongate. *Leaflets* numerous, regularly bifarious, equidistant, linear-lanceolate, gradually acuminate into a very slender filamentose tip, tricostulate, the mid-costa very sparingly bristly spinulous on both surfaces, the other two costæ furnished with a few long bristles on the upper surface and smooth beneath. *Female spadix* very long and flagelliform, with remote partial inflorescences which are inserted outside the mouth of their respective spathes; upper primary spathes very long, very narrow and very closely sheathing; spikelets inserted above the mouth of their own spathe, 5–6 cm. long with 6–7 alternately distichous rather remote flowers on each side. *Fruit* ovoid-elliptic, 23–25 mm. long, 14–15 mm. broad. *Scales* in 18 series, straw-yellowish, channelled along the middle with a very narrow dark line all round. *Seed* oblong, rather deeply ruminate; embryo lateral, in the centre of one of the faces.

Tenasserim.

105. **C. Diepenhorstii** Miq.—Scandent. *Sheathed stem* 1·5–3 cm. in diam. *Leaves* elongate; petiole rather robust and long. *Leaflets* numerous, equidistant, linear-ensiform, the largest 35–45 cm. long, 15–18 mm. broad, unicostate, in the upper surface the mid-costa only bristly, underneath the mid-costa and one nerve on each side of it furnished with long conspicuous bristles; margins ciliate near the apex, otherwise smooth. *Male* and *female spadices* flagelliform, some metres in length, with very remote partial inflorescences. *Male spikelets* horizontal or deflexed, inserted just at the mouth of their own spathes, 1–3 cm. long, with 5–12 flowers on each side. *Female spikelets* 4–12 cm. long, horizontal or deflexed, with a distinct axillary callus, with 4–10

alternately distichous distant flowers on each side. *Fruit* sphæric, 16–18 mm. in diam. *Scales* in 18–24 series, superficially channelled along the middle, light-yellowish with a narrow darker intramarginal line. *Seed* globular, deeply pitted; albumen deeply ruminate; embryo basal.

Malayan Peninsula. Borneo. Sumatra.

106. C. marginatus Mart.—Scandent. *Sheathed stem* 20–25 mm. in diam. *Leaf-sheaths* flagelliferous, opened a long way down on the ventral side at the mouth, armed with rather large solitary or confluent spines which leave a distinct impression of their outline. *Leaves* elongate; the petiole rather long, smooth beneath, narrowly channelled above. *Leaflets* very numerous, rather closely equidistant, shining above, linear-ensiform, the largest 25–26 cm. long, 13–15 mm. broad, 3-costate, the 3 costæ naked above and finely densely spinulous beneath; the margins thickened and finely scabrid on the lower surface.

Borneo.

107. C. ciliaris Bl.—Very slender. *Leaf-sheaths* and *spadices* hairy scabrid in every part. *Leaves* very delicate, 35–70 cm. long. *Leaflets* very numerous, very closely and regularly set, very small, 7–10 cm. long, 5–8 mm. broad, very narrowly linear, with conspicuously hairy ciliate margins. *Fruit* roundish, 10–12 mm. in diam.

Java.

108. C. exilis Griff.—Slender or very slender. *Leaf-sheaths, spathes* and *spathels* very scabrid. *Leaves* 0·6–1·2 m. long. *Leaflets* rather numerous, 15–25 cm. long, 8–14 mm. broad, equidistant, more or less covered with long hairs on both surfaces and at the margins. *Fruit* narrowly ellipsoid or ovoid elliptic, varying from 15-16 mm. in length and 8 mm. in width to 22 mm. by 7 mm. *Seed* linear-oblong, acute at both ends.

The Malayan Peninsula.

109. C. hispidulus Becc.—Rather slender. *Leaf-sheaths* densely covered with fulvous hairs when young, ultimately scabrid. *Spathes* and *spathels* scabrid. *Leaves* about 50 cm. long. *Leaflets* not very numerous, equidistant, linear-lanceolate, 18–20 cm. long, 10–15 mm. broad; these with very numerous spinuliferous nervelets on both surfaces; the margins conspicuously remotely and adpressedly hairy. *Fruit* elongate-ellipsoid, 2 cm. long, 8–11 mm. broad.

Borneo.

110. C. pilosellus Becc.—Slender. *Leaf-sheaths* almost unarmed, not scabrid. *Leaves* about 60 cm. long. *Leaflets* numerous, approximate, equidistant, lanceolate, about 10 cm. long, 10–11 mm. broad, with the mid-costa and 2–3 secondary nerves on each side of it furnished with long bristles above, and with very numerous hairy-spinulous nervelets beneath; the margins with long spreading hairs.

Borneo.

111. C. sarawakensis Becc. Slender. *Leaf-sheaths* armed with a few scattered straight horizontal spines, not scabrid. *Leaves* 60–65 cm. long. *Leaflets* few, rather remotely inequidistant, linear-lanceolate, 20–22 cm. long, 15–16 mm. broad with 5-7 very slender spinulous costæ above and excessively numerous hairy spinulous nervelets beneath.

Borneo.

112. **C. rhomboideus** Bl.—Scandent, of moderate size. *Leaf-sheaths* about 3 cm. in diam., tomentose, armed with very short ascendent broad-based spines. *Leaves* 0·7–1 m. long; petiole elongate, channelled (?) above, rachis obsoletely angular, tomentose. *Leaflets* few, large, rhomboidal with 9–12 radiate not spinulous costæ, not ansate and almost symmetric at the base. *Male spadix* simply decompound. *Male flowers* cylindraceous, 8 mm. long, 2 mm. thick.

Java.

C. rhomboideus, var. **uberrimus** Miq.—*Male spadix* partially supra-decompound.

Sumatra.

113. **C. tomentosus** Becc.—Scandent and of moderate size. *Leaf-sheaths* about 2 cm. in diam., cottony-tomentose, armed with broad-based very short ascendent spines. *Leaves* relatively short and robust; petiole elongate, cylindraceous or obsoletely angular-convex above; rachis white, tomentose (like the petiole), obsoletely bifaced above. *Leaflets* large, about 25 cm. long, 10 cm. broad, with 7–9 radiate naked costæ, not ansate and almost symmetric at the base.

The Malayan Peninsula.

C. tomentosus var. **intermedius** Becc.—Smaller. *Leaf-sheaths, petioles* and *rachises* less cottony-tomentose than in the type. *Leaflets* about 15 cm. long, 5–5·5 cm. broad.

The Malayan Peninsula.

C. tomentosus var. **korthalsiæfolius** Becc.—Smaller. *Sheathed stem* 1 cm. in diam. almost glabrous. *Leaflets* about 14 cm. long, 5 cm. broad, almost shining above, 5–7-costulate.

The Malayan Peninsula.

114. **C. Blumei** Becc.—*Leaves* apparently short; rachis furfuraceous, strongly clawed, distinctly bifaced towards the summit above. *Leaflets* few, broadly rhomboidal, asymmetric and ansate at the base, with 5–7 radiate and naked costæ, of which the mid-costa slightly eccentric and stronger than the others.

Borneo.

115. **C. spectabilis** Bl.—Slender. *Leaf-sheaths* gray-furfuraceous, armed with small spines. *Leaves* about 60 cm. long; petiole very short. *Leaflets* few, oblong-obovate, 18–20 cm. long, 8 cm. broad, with 5–7 radiate costæ, of which 3–4 bristly above. *Male spadix* supradecompound, very long.

Java.

C. spectabilis var. **sumatranus** Becc.—*Leaf-sheaths* glabrescent, armed with numerous, small, broadly-laminar, light spines. *Leaflets* oblong-obovate or ovate-subrhomboid, 18–20 cm. long, 6 cm. broad, with 5–7 costæ, of which 3–4 inconspicuously remotely spinulous.

Sumatra.

116. ***C. Bousigonii*** Pierre.—*Sheathed stem* 10–12 mm. in diam. *Leaf-sheaths* densely armed with small straight spines. *Leaves* 75–85 cm. long; the petiole 15–20 cm. long. *Leaflets* few, subovate-rhomboid, cuneately attenuate towards the base, quite glabrous, about 15 cm. long, 6 cm. broad, with 5–7 radiately divergent and naked costæ. *Female spadix* flagelliform, about as long as the leaves. *Fruiting perianth* shortly pedicelliform. *Fruit* broadly ovoid, very suddenly beaked, 18 mm. long, 14 mm. broad. *Scales*, in 18 series. *Seed* ovoid, superficially pitted.

Cochin-China.

117. ***C. heteracanthus*** Zipp.—Of moderate size. *Leaves* cirriferous. *Leaflets* not numerous, 21–25 cm. long, 4·5–6 cm. broad, narrowly oblong or subspathulate, distinctly concave-convex with 5 naked costæ, green, shining, very sharply and closely transversely veined on both surfaces, paired on each side of the rachis, the pairs alternate or opposite with long vacant spaces interposed; margins quite smooth. *Male spadix* ultradecompound, elongate; secondary spathes membranous, tubular-infundibuliform, loosely sheathing.

New Guinea.

118. ***C. symphysipus*** Mart.—Of moderate size. *Leaves* subcirriferous, with the rachis strongly clawed at its summit, but not prolonged beyond the diminutive leaflets. *Leaflets* remotely inequidistant, not fascicled, elliptic-lanceolate or oblanceolate, discolorous, or green above and light-yellowish subochraceous beneath, with 6–7 slender quite naked costæ, margins spinulous; the largest leaflets 28 cm. long, 5 cm. broad. *Female spadix* rather large and elongate; female flowers stalked on an elongate involucrophorum. *Fruit* sphæric, 1 cm. in diam. *Scales* in 24 series. *Seed* orbicular, somewhat compressed, not pitted on the surface; albumen equable; embryo lateral.

Celebes.

119. ***C. Cumingianus*** Becc.—Of moderate size. *Leaflets* 20–24 cm. long, 4·5–5·5 cm. broad, oblong-spathulate, slightly concave-convex, opaque, slightly paler beneath than above, clustered into alternate groups of 2–4 on each side of the rachis, not very sharply transversely veined, plicate-many-costate, the mid-costa spinulous above; margins closely serrate-spinulous. *Female spadix* ultradecompound; secondary spathes, submembranous, loosely sheathing. *Female flowers* stalked on an elongate slender involucrophorum.

Philippines.

120. ***C. vitiensis*** Becc.—Apparently rather slender. *Leaves* 1–1·2 m. long. *Leaflets* concolorous, inequidistant, remote, not fascicled, narrowly lanceolate, 22–25 cm. long, 35–36 mm. broad, 5-costate, the costæ smooth on both surfaces and the margins also smooth except at the summit. *Female spadix* not very long, with few partial inflorescences; primary spathes cylindraceous, very sparingly prickly or even smooth; secondary spathes short, cyathiform, loosely sheathing; female flowers more or less stalked by the involucrophorum. *Fruiting perianth* pedicelliform. *Fruit* globular, about 1 cm. in diam.

Fiji Islands.

121. ***C. kandariensis*** Becc.—Slender. *Leaves* distinctly cirriferous. *Leaflets* very few, concolorous, lanceolate, long-acuminate, flat or nearly so, inconspicuously 5-costulate, paired on each side of the rachis, the pairs usually opposite and remote, the costæ and margins quite smooth. *Male spadix* inserted remote from the mouth of the sheath; primary spathes almost unarmed; spikelets very short, with very few assurgent (not flatly bifarious) flowers.

Celebes.

122. *C. adspersus* Bl.—Scandent and rather large. *Leaves* 1·8–2·5 m. long in the pinniferous part, the cirrus ·6–1 m. long, somewhat irregularly armed with half-whorled claws; petiole rather short. *Leaflets* subequidistant, 18–20 on each side, very narrowly lanceolate, 30–40 cm. long, 20–27 mm. broad, with 3 bristly costæ above, smooth underneath; margins conspicuously ciliate. *Female spadix* 2–2·7 m. long with many spreading and arched partial inflorescences; spikelets arched, the largest 7–8 cm. long with two assurgent series of 8–10 flowers each; involucrophorum pedicelliform; involucre furnished with a pedicel, 1·5–2 mm. long, for the neuter flower. *Fruit* stalked by the pedicelliform involucrophorum, globose, 13–14 mm. in diam. *Scales* deeply channelled. *Seed* globular, coarsely pitted; albumen subruminate; embryo basal.

Java.

123. *C. plicatus* Bl.—Slender and probably scandent. *Leaves* about 60 cm. long, terminated by two decurrent leaflets (sometimes cirriferous ?); petiole very short. *Leaflets* not very numerous, inequidistant, paired on each side of the rachis, 13–15 cm. long, 15–18 mm. broad, subspathulate, concave-convex, very suddenly caudate-acuminate, concolorous, deeply longitudinally plicate, and with about 7 costæ quite smooth on both surfaces.

Celebes.

124. *C. Minahassæ* Warb.—Scandent, very slender. *Leaf-sheaths* 6–7 mm. in diam., irregularly armed with flat subulate spines. *Leaves* 35–50 cm. long with a slender feebly clawed cirrus; petiole 1–3 cm. long. *Leaflets* 14–16 in all, approximate in 4 groups of 4, separated by long vacant spaces, subconcolorous, oblanceolate, with 3–5 slender smooth costæ. *Female spadix* elongate-flagelliform; spikelets subscorpioid, inserted above the mouth of their respective spathes with a distinct axillary callus. *Fruit* ovoid, distinctly beaked, about 1 cm. long, 6 mm. broad. *Scales* reddish-brown, not or slightly channelled. *Seed* ovoid, about 6 mm. long, irregularly pitted; albumen equable; embryo basal.

Celebes.

125. *C. Cawa* Bl.—Slender. *Leaf-sheaths* densely armed with slender straight spines. *Leaves* distinctly cirriferous; petiole elongate. *Leaflets* few, alternate, remote, subequidistant, lanceolate, about 30 cm. long with about 5 (?) spinulous costæ. *Female spadix* elongate, with 3-4 partial inflorescences, these bearing few, about 4 cm. long, spikelets. *Fruit* pisiform, mucronate.

Moluccas.

126. *C. equestris* Willd. Scandent, rather slender. *Leaf-sheaths* not densely spinulous. *Leaves* cirriferous. *Leaflets* few, inequidistant, subaggregate, lanceolate, acute, 18–20 cm. long, 3·5–4·5 cm. broad, with about 5 (?) spinulous-setose

costæ. *Spadix* (*female ?*) about 1 m. long, with 4–5 remote partial inflorescences spikelets arched, deflexed. *Fruit* pisiform, shortly beaked. *Scales* straw coloured.

Moluccas.

127. **C. Cuthbertsonii** Becc.—Small and slender. *Leaves* about 25 cm. long, not cirriferous. *Leaflets* few (9 in all in two specimens) of which 4 approximate at the summit, the others scattered, 10–13 cm. long, 10–13 mm. broad, narrowly lanceolate, acuminate, unicostate, those of the terminal pair connate up to about the middle. *Female spadix* short, rigid with few small erect, 6–7 cm. long, partial inflorescences; spikelets 18–20 mm. long with 6–8 flowers in all, biseriate and pointing upwards; involucrophorum subdiscoid, shortly pedicellate. *Fruiting perianth* pedicelliform. *Fruit* broadly ovate-elliptic, about 12 mm. long, 8 mm. broad, suddenly beaked. *Scales* reddish-brown, faintly channelled. *Seed* with equable albumen.

British New Guinea.

128. **C. spathulatus** Becc.—Slender, scandent. *Sheathed stem* 10–12 mm. in diam. *Leaf-sheaths* very thickly coriaceous, yellowish like the other parts of the plant, armed with short semiconic ascendent spines. *Leaves* sub- or feebly cirriferous; petiole short. *Leaflets* very few (5 or more), inequidistant, oblong-obovate or spathulate, strongly concave-convex, about 20 cm. long, 6–7 cm. broad, 3–5-costate, smooth on both surfaces; margins quite smooth, thickened. *Female spadix* flagelliform, with a slender aculeolate rather short terminal appendix; spikelets distichous, with a distinct axillary callus, slightly arched, 2·5–6 cm. long, with 8–15 subhorizontal flowers on each side. *Fruiting perianth* shortly pedicelliform. *Fruit* ovoid-elliptic, topped by a cylindricous 3 mm. long beak, 12 mm. long, 7 mm. broad. *Scales* very light coloured, narrowly channelled. *Seed* oblong, 8 mm. long, coarsely pitted; albumen equable; embryo basal.

The Malayan Peninsula.

C. spathulatus var. **robustus** Becc.—*Sheathed stem* 20–22 mm. in diam. *Leaf-sheath* flagella up to 2 m. in length. *Leaves* 1–1·3 m. long, subcirriferous. *Leaflets* about 5 on each side of the rachis, some of them up to 40 cm. in length, a few of the summit smaller, semi-abortive and decurrent along the aculeolate rachis. *Female spadix* robust, partial inflorescences about 30 cm. long, with about 10 spikelets on each side. *Fruit* about 15 mm. long.

The Malayan Peninsula.

129. **C. Martianus** Becc.—Scandent, very slender. *Leaf-sheaths* yellowish like the other parts of the plant, armed with very small semi-conic ascendent spines. *Leaves* small, impari-pinnate or subcirriferous, petiole obsolete. *Leaflets* about 10 in all; very inequidistant, narrowly elliptic-lanceolate or oblanceolate, 14–15 cm. long, 18–20 mm. broad, sub-5-costulate, margins quite smooth. *Male spadix* very slender, with 3–4 remote partial inflorescences and terminating in a filiform aculeolate flagellum; spikelets 3–3·5 cm. long, with 5–6 very remote horizontal flowers on each side, inserted outside the mouth of their own spathe with a distinct axillary callus.

Pulo Penang.

130. **C. insignis** Griff.—Slender, probably scandent. *Sheathed stem* 8–18 mm. in diam. *Leaf-sheaths* yellowish like the other parts of the plant, armed with 1–8 mm. long, semiconic, horizontal or slightly deflexed black-tipped prickles. *Leaves* not cirriferous, ·4–1 m. long; petiole 10–25 cm. long. *Leaflets* very few, those of the terminal pair connate about midway up, firm, subpergamentaceous, ovate or obovate-oblong, concave-convex, quite glabrous on both surfaces, unicostate and with 6–8 slender nerves on each side of the mid-costa; transverse veinlets very sharp and continuous across the blade; margins quite smooth.

The Malayan Peninsula.

131. **C. ornatus** Bl.—High scandent and very robust. *Sheathed stem* 4–7 cm. in diam. *Leaf-sheath* flagella up to 10 m. in length. *Leaves* very large, as much as 4 m. long with diminutive leaflets at their summit. *Leaflets* numerous, equidistant, very large, 50–60 up to 80 cm. long, 5–9 cm. broad, elongate-lanceolate, 5-costate. *Male* and *female spadices* very long, with a long robust and strongly clawed flagellum at their summit. *Male spikelets* 5–8 cm. long with 13–17 flatly bifarious flowers on each side; spathels concave, broadly bracteiform. *Female spikelets* thick and rigid, 10–18 cm. long with 10–20 flowers on each side. *Fruiting perianth* distinctly pedicelliform. *Fruit* large, 3–3·5 cm. long, sub-obovate-ellipsoid, shortly conically beaked. *Scales* in 15 series, deeply channelled. *Seed* irregular, angular; albumen equable; embryo basal.

C. ornatus var. **javanicus** Becc. (Forma typica). *Leaf-sheaths* almost unarmed. *Leaves* of the upper part of the plant with distinctly 5-costate leaflets; 3 costæ spinulous above. *Fruit-scales* spadiceous.

Java.

C. ornatus var. **horridus** Becc.—*Leaf-sheaths* powerfully armed with strong laminar spines 2–3 cm. long, confluent and disposed in transverse rows.

The Malayan Peninsula.

C. ornatus var. **sumatranus** Becc.—*Leaf-sheaths* very strongly armed with non-confluent, obliquely seriate, robust, laminar spines. *Fruit-scales* almost black. *Seed* suborbicular.

C. ornatus var. **philippinensis** Becc.—*Fruit* ellipsoid, 3·5 cm. long, 2·3 mm. broad. *Scales* reddish-brown. *Seed* oblong, obscurely 4-angular.

The Philippines.

C. ornatus var. **mitis** Becc.—*Leaf-sheaths* with a few large broad laminar spines near the mouth, smooth elsewhere.

Borneo.

132. **C. Scipionum** Lour.—Scandent. *Sheathed stem* 3–6 cm. in diam. *Leaf-sheaths* very elongate, almost woody, sparingly armed with laminar spines. *Leaf-sheath* flagella, 4–5 m. long. *Leaves* large, about 2 m. long, not cirriferous. *Leaflets* 20–30 on each side of the rachis, equidistant, elongate-lanceolate or lanceolate-ensiform, 3–5-costulate, up to 50–60 cm. long, 5–5·5 cm. broad, the upper ones much reduced in size; margins smooth. *Male* and *female spadices* as much as 6–7 m. long. *Female partial inflorescences* very long, up to ·8–1·8 m. long, with 15–20 distichous spikelets on each side; spikelets with a distinct axillary callus, vermicular, up to 15–18 cm. long,

with 30–35 flowers on each side. *Fruiting perianth* distinctly pedicelliform. *Fruit* small, broadly ovoid, or sub-obovoid, 13–14 mm. long, 8 mm. broad, shortly beaked. *Scales* in 15 series, channelled. *Seed* coarsely pitted.

The Malayan Peninsula, Sumatra, Borneo.

133. **C. densiflorus** Becc.—Scandent. *Sheathed stem* 3–4 cm. in diam. *Leaf-sheaths* almost woody, strongly armed with short, flat, broad-based spines. *Leaves* not cirriferous, large, 2–2·6 m. long; petiole almost obsolete. *Leaflets* numerous, closely equidistant, linear-ensiform, up to 34 cm. long, 14–16 mm. broad, distinctly 3-costulate; margins remotely spinulous. *Male* and *Female spadices* elongate, prolonged into a very long clawed flagellum; secondary spathes smooth. *Female partial inflorescences* rather short and dense; spikelets with a distinct axillary callus, arched, thick, 7–9 cm. long with 10–16 very approximate flowers on each side; spathels very closely packed. *Fruiting perianth* shortly pedicelliform. *Fruit* closely packed, not regularly bifarious, obovate, stoutly beaked, 15–17 mm. long, 1 cm. in diam. *Scales* in 18 series, slightly channelled. *Seed* ovoid-elliptic, deeply pitted; albumen deeply ruminate; embryo almost in the centre, on the face opposite the chalazal fovea.

The Malayan Peninsula, Singapore.

134. **C. Ridleyanus** Becc.—Scandent and of moderate size. *Leaves* large, sub-cirriferous, terminating in a finely and densely clawed rachis with very diminutive leaflets; petiole short. *Leaflets* numerous, equidistant, ensiform, up to 45 cm. long, 2·5 cm. broad, shining, 3-costulate, the costæ smooth above and bristly beneath; margins smooth. *Female spadix* very long and flagelliform with few remote partial inflorescences; these robust and rigid, straight, 75–90 cm. long, with 9–12 spikelets on each side and terminating in a narrow tail-like aculeolate appendix; primary and secondary spathes densely and minutely prickly; spikelets thick, vermicular, strongly arched, inserted inside the mouth of their own spathes, 7–11 cm. long, with numerous, very closely packed, distinctly 4-farious flowers, as the neuter flowers are very similar and as large as the fertile ones; spathels very broadly infundibuliform, partially enclosed one inside the other. *Female flowers* ovoid, 4 mm. long.

Singapore.

135. **C. zeylanicus** Becc.—Scandent and robust. *Leaves* very large. *Leaflets* numerous, equidistant, narrowly elongate-lanceolate, 25–35 cm. long, 2 cm. broad, with 3 slender, very sparingly bristly costæ in the upper surface and with several slender hairy nerves beneath. *Male spadix* very large, with several panicled-pyramidate, large, partial inflorescences; spikelets small, broad, flattened, 15–20 mm. long with 12–15 very closely set, flatly bifarious flowers on each side. *Female spadix* very different from the male one; partial inflorescences large, 40–60 cm. long, or more, diffuse, with many robust, 10–16 cm. long, spikelets. *Female flowers* about 6 mm. long. *Fruiting perianth* explanate, subtended by the subpedicelliform involucrophorum. *Fruit* sphæric, about 18 mm. in diam., conically beaked. *Scales* deeply channelled, very convex. *Seed* globular, finely tubercled and pitted; albumen deeply ruminate, embryo sub-basal.

Ceylon.

136. C. ovoideus Thw.—Scandent and robust. *Leaves* very large, rachis spinulous above. *Leaflets* numerous, equidistant, ensiform, very acuminate, up to 55 cm. long, 23 mm. broad, 3- or sub-5-costulate, with long bristles on 3 nerves beneath and on the upper surface usually bristly on the side nerves only. *Female spadix* large and diffuse, with stout and stalked partial inflorescences; spikelets robust, 8–10 cm. long, with 14–16 distichous flowers on each side. *Female flowers* ovoid, about 5 mm. long. *Fruiting perianth* explanate, subtended by the subpedicelliform involucrophorum. *Fruit* obovoid, beaked, 15–16 mm. long, about 1 cm. broad. *Scales* deeply channelled. *Seed* ovoid, slightly flattened, slightly irregularly furrowed; albumen non-ruminate; embryo basal.

Ceylon.

137. C. polystachys Becc.—*Leaf-sheaths* 3·5–4 cm. in diam., covered at short intervals with complete membranous rings which are densely fringed with long blackish criniform bristles. *Leaves* large; rachis spinulous above. *Leaflets* numerous, equidistant, linear-ensiform, up to 50 cm. long, 2 cm. broad, with 3 costæ which are more or less bristly on both surfaces. *Female spadix* about 1 m. long, pyramidate, diffuse, with 4–5 gradually smaller partial inflorescences on each side; partial inflorescences with a distinct pedicellar part inserted far inside their own spathes: the largest 50–55 cm. long and composed of 18–20 secondary spathes, of which the lower ones bear 2–3 spikelets each: only the spathels near the summit having solitary spikelets; these distinctly stalked, 6–8 cm. long, with 14–16 flowers on each side; involucrophorum calyciform, narrowed at the base. *Female flowers* 3–5 mm. long.

Native country unknown.

138. C. andamanicus Kurz.—Very large and high scandent. *Leaf-sheaths* 8–10 cm. in diam. with numerous, approximate, small, membranous crests which are fringed with capillary brittle spiculæ. *Leaves* very large; rachis spinulous above. *Leaflets* very numerous, equidistant, elongate-ensiform, 50–70 cm. long, 2·5–3·5 cm. broad, 3-costulate, more or less bristly on both surfaces; margins rather distantly bristly ciliate. *Male spadix* panicled, shorter than the leaves; spikelets 20–25 mm. long with 15–20 very crowded bifarious flowers on each side. *Male flowers* 3 mm. long. *Female spadix* panicled, about 1 m. long; partial inflorescences 50–60 cm. long, with 8–11 distichous—10–15 cm. long—spikelets on each side; involucrophorum calyciform, subpedicellate. *Female flowers* about 6 mm. long. *Fruit* ovoid-elliptic, conically beaked, about 18 mm. long, 10–11 mm. broad. *Scales* in 15 series, not channelled, with an elongate, triangular, scarious, finely-fringed point. *Seed* coarsely grooved; albumen equable; embryo basal.

The Andaman and Nicobar Islands.

139. C. Zollingerii Becc.—Scandent and very robust. *Leaf-sheaths* almost woody, strongly armed with unequal flat spines. *Leaves* very large, as much as 4-5 m. long in the pinniferous part. *Leaflets* numerous, equidistant, ensiform, unicostate, the largest 50–70 cm. long, 3–3·5 cm. broad, underneath the mid-costa furnished with a few 2–2·5 cm. long bristles and the side nerves faint and smooth; above the side nerves only with a few long bristles. *Male spadix* large and much branched; partial inflorescences panicled, cupressiform, with many secondary branches or compound spikes; ultimate spikelets very small, 1 cm. long. *Female spadix* 1–1·5 m. long, broadly panicled; spikelets conspicuously pedicellate, 8–10 cm. long, with 15–25 distichous flowers on each side. *Fruiting perianth* explanate, subtended by the subpedicelliform involucrophorum. *Fruit* sphæric, 1 cm. in diam. *Scales* superficially channelled. *Seed* smooth; albumen equable.

Celebes.

140. C. Merrillii Becc.—Scandent and robust. *Leaf-sheaths* thick, woody, 6–7 cm. in diam.; armed with innumerable small spiculæ and rigid brittle bristles. *Leaves* very large; rachis spinulous above. *Leaflets* very numerous, equidistant, elongate-ensiform, more or less distinctly 3-costulate, the side costæ slender and more or less furnished with long bristles above, below the mid-costa furnished with long bristles and the side nerves smooth. *Male spadix* large and much branched; partial inflorescences panicled, cupressiform, with many secondary branches or compound spikes; ultimate spikelets inserted inside of their own spathes with a distinct flattened pedicel, very brittle, the largest about 25 mm. long, with 11–12 very approximate flatly bifarious flowers on each side.

The Philippines.

141. C. aquatilis Ridley.—Scandent and of moderate size. *Leaves* about 2 m. long in the pinniferous part. *Leaflets* very numerous, equidistant, narrowly ensiform, up to 30–33 cm. long, 2·5–4 cm. broad, unicostate, smooth in the upper surface and finely bristly spinulous on 3–5 nerves beneath where further sprinkled with very small rusty scales. *Male spadix* large and diffuse, with loosely panicled, 40–90 cm. long, partial inflorescences; ultimate spikelets 10–15 mm. long, complanate with 8–10 flatly bifarious closely set flowers on each side. *Female spadix* broadly panicled; spikelets 8–10 cm. long, with 18–20 flowers on each side. *Fruit* globose, about 1 cm. in diam. *Scales* in 12 series, narrowly channelled. *Seed* orbicular, deeply pitted on the back, its surface hairy velvety; albumen equable; embryo basal.

The Malayan Peninsula, Singapore.

142. C. Warburgii K. Schum.—Scandent and rather robust. *Leaves* large; petiole almost obsolete. *Leaflets* very numerous, very approximate, pectinate, rigid, narrowly lanceolate, 20–26 cm. long, 18–22 mm. broad, with 3 costæ (the side ones slender) bristly on both surfaces; margins adpressedly and closely spinulous, the lowest leaflets horizontal, more approximate and more narrow than the upper ones. *Female spadix* rather large, with numerous distichous rather approximate, 30–45 cm. long, partial inflorescences; secondary spathes tubular-infundibuliform, dry and discolorous in their upper part; spikelets somewhat flattened, the largest 6–7 cm. long with about 20 flowers on each side. *Female flowers* 3 mm. long. *Fruit* small, ellipsoid-ovate, very suddenly apiculate, about 1 cm. long, 6·5–7 mm. broad. *Scales* very convex, rather deeply channelled. *Seed* globular; albumen equable.

German New Guinea.

143. C. Moseleyanus Becc.—Probably scandent and of moderate size. *Leaves* apparently rather large; the rachis smooth above in the intermediate portion.

Leaflets not very numerous, sub-equidistant, 7–10 cm. apart on each side, 25–32 cm. long, 3–4·5 cm. broad, lanceolate or elliptic-lanceolate, flat, with 5 costœ, of these at least 4 spinulous above, all smooth beneath; margins spinulous-ciliate. *Male spadix* diffuse; spikelets spreading, comb-like, 15–25 mm. long, with 6–15 flatly bifarious horizontal flowers on each side. *Female spadix* diffuse, with a few not very distant partial inflorescences; spikelets 4·5–6 cm. long, with 10–12 distichous flowers on each side, closely zig-zag sinuous between the flowers. *Fruiting perianth* shortly pedicelliform. *Fruit* small, globose, 8–9 mm. in diam. *Scales* squarrose, in 12 series, broadly and superficially channelled. *Seed* small, globose, deeply pitted; albumen subruminate; embryo basal.

Lower Philippines.

144. C. formosanus Becc.—*Sheathed stem* 3-3·5 cm. in diam. *Leaves* 1 m. and more long in the pinniferous part; rachis prickly lower down in the upper surface and smooth upwards. *Leaflets* not very numerous, distinctly geminate or ternate on each side of the rachis, elongate-lanceolate or oblanceolate, 20–30 cm. long, 3–3·5 cm. broad, subulately acuminate from their upper third part, flat, with 3 rather slender on both surfaces smooth costæ; margins spinulous-serrate. *Male spadix* diffuse, terminating in a small tail-like aculeolate appendix; spikelets arched, spreading, inserted just at the mouth of their own spathe, broad, flattened, 2·3 cm. long with 8–10 flatly bifarious, 5-6 mm. long, ovoid-oblong flowers on each side.

Formosa.

145. C. Rumphii Bl.—Scandent and of moderate size. *Leaves* large. *Leaflets* rather remotely equidistant, about 75 cm. long, 3·5-4 cm. broad, narrowly lanceolate, very acuminate, with the mid-costa and one nerve on each side of it bristly beneath; margins conspicuously ciliate. *Female spadix* large, broadly panicled, shorter than the leaves. *Fruit* globose-oblong, beaked, the size of a musket bullet.

Amboina.

146. C. palustris Griff.—Scandent. *Sheathed stem* 3-4 cm. in diam. *Leaf-sheaths* armed with laminar, scattered or subseriate spines. *Leaves* large; the upper ones of the adult plant cirriferous and with a short and sometimes almost obsolete petiole. *Leaflets* not very numerous, usually in pairs or ternate on each side of the rachis, with long vacant spaces interposed, firmly papyraceous, more or less broadly lanceolate or elliptic-lanceolate or oblanceolate with a bristly apex more or less concave-convex, shining above, with 5–7 costæ, which are usually smooth on both surfaces, or the mid-costa only occasionally spinulous above; margins sparingly spinulous lower down, ciliate upwards. *Male spadix* forming a large panicle, 1–1·5 m. long, with many rather approximate partial inflorescences; ultimate spikelets 1·5–2·5 cm. long with very crowded, bifarious, ovate, 4 mm. long flowers. *Female spadix* not very diffuse, with many rather approximate partial inflorescences, the largest of these 40–50 cm. long, with 6–8 distichous spikelets on each side; the largest spikelets 8–10 cm. long with 12–13 flowers on each side. *Female flowers* about 4 mm. long. *Fruiting perianth* split not quite to the base. *Fruit* ovoid-elliptic or subobovoid, shortly beaked, 15–18 mm. long, 10–12 mm. broad. *Scales* flattish, very superficially channelled. *Seed* ovoid, irregularly pitted; albumen equable; embryo basal.

Tenasserim, Andamans and Nicobars.

C. palustris var. *amplissmus* Becc.—Very robust. *Sheathed stem* 4·5 cm. in diam. *Leaves* as much as 3·5 m. long in the pinniferous part. *Leaflets* subequidistant, only occasionally approximate in pairs on each side of the rachis, very large, up to 50 cm. long and 8–10 cm. broad.

Native country uncertain.

C. palustris var. *malaccensis* Becc.—*Sheathed stem* 2·5–3 cm. in diam. *Leaflets* not very numerous, very inequidistant, 2–3 approximate—often with a solitary one and a long vacant space interposed—on each side of the rachis, 5–7-costulate, lanceolate, the largest 30–33 cm. long, 3–4 cm. broad; spikelets more slender than in the type.

The Malayan Peninsula.

C. palustris var. *cochinchinensis* Becc.—Smaller than the type. *Sheathed stem* about 2·5 cm. in diam. *Leaflets* in distant pairs on each side of the rachis, with long vacant spaces interposed, narrowly lanceolate, 15–35 cm. long, 4–5 cm. broad. *Fruit* broadly ovoid-ellipsoid, 15 mm. long, 9 mm. broad.

Cochin-China.

147. C. latifolius Roxb.—Scandent. *Sheathed stem* about 3 cm. in diam. *Leaf-sheaths* armed with very large and broad, laminar, sub-regularly verticillate spines. *Leaves* 2–2·5 m. long in the pinniferous part. *Leaflets* not numerous, almost herbaceous in texture, very inequidistant, rather regularly geminate on each side of the rachis, strongly concavo-convex, broadly lanceolate or elliptic-lanceolate, 30–35 cm. long, 6–8 cm. broad, usually with 5–7 costæ, these smooth on both surfaces. Otherwise very similar to the typical form of *C. palustris.*

N. E. India.

C. latifolius var. *marmoratus* Becc.—More slender than the type. *Leaf-sheaths* about 2 cm. in diam., marbled with mealy and dark green spots and armed with verticillate broad-based and smaller interposed spines. *Leaves* smaller, with fewer pairs of leaflets; these 25–28 cm. long and 6 cm. broad at most.

N. E. India.

148. C. spinifolius Becc.—Scandent, rather slender. *Leaf-sheaths* 1-2 cm. in diam., sparingly prickly. *Leaves* of the upper part of the plant cirriferous, 50–65 cm. long in the pinniferous part; petiole short or 8-10 cm. long. *Leaflets* not very numerous, distinctly geminate or ternate on each side of the rachis, rigid papyraceous, elliptic or lanceolate-elliptic, 10–15 cm. long, 20–25 mm. broad, acuminate, 3–5-costulate, the mid-costa usually furnished on the upper surface at least with one, more frequently several, relatively strong and short erect spines, smooth underneath, occasionally smooth on both surfaces; margins remotely spinulous. *Lower leaves* paripinnate, the leaflets 3–4 cm. broad, and with several slender, 5–7 mm. long spines on 3–5 costæ above. *Male spadix* slender, elongate, simply decompound; spikelets 15–20 mm. long with very closely packed flowers. *Female spadix* shorter than the leaves, diffuse, with few partial inflorescences; spikelets 5–6 cm. long with 7–8 flowers on each side, zig-zag sinous between the flowers. *Fruiting perianth* almost explanate. *Fruit* sphæric, beaked, 1 cm. in diam. *Scales* in 18 series, almost squarrose, flattish, not or obscurely channelled. *Seed* globose, deeply pitted and irregularly grooved; albumen subruminate.

The Philippines.

149. *C. trispermus* Becc.—*Leaves* non-cirriferous (of the lower part of the plant?) *Leaflets* few, inequidistant, approximate in pairs on each side of the rachis, somewhat concave-convex, oblanceolate, 30–32 cm. long, 6 cm. broad, with 5 distinct costæ, these smooth on both surfaces; margins closely and adpressedly spinulous. *Female spadix* panicled; partial inflorescences 40–45 cm. long, with 5–6 spikelets on each side; spikelets 12–16 cm. long with 12–15 flatly bifarious, 6 mm. long flowers on each side. *Fruit* with 3 seeds, broadly obovoid, suddenly beaked, 18 mm. long, 12–13 mm. broad. *Scales* in 15 longitudinal series and each series composed of about 12 scales, shining, faintly channelled. *Seeds* smooth, convex externally and with 2 flat faces on the axial side; albumen equable; embryo basal.

The Philippines.

150. *C. manillensis* H. Wendl.—*Female spikelets* large, thickly vermicular, cylindraceous, 18 cm. long (in one specimen), with about 15 flowers on each side, inserted just at the mouth of their own spathe; spathels shortly infundibuliform. *Fruiting perianth* explanate. *Fruit* usually with 3 seeds, globose, 15–17 mm. in diam., shortly beaked, the thin scaly pericarp very brittle. *Scales* in 12 longitudinal series, each series composed of about 6 well-conformed scales, shining, rather deeply channelled. *Seeds* smooth, convex externally and with 2 flat faces on the axial side; albumen equable; embryo basal.

The Philippines.

151. *C. axillaris* Becc.—Scandent. *Sheathed stem* 2 cm. in diam. *Leaves* about 1m. long in the pinniferous part, terminated by a rather slender cirrus; petiole almost obsolete. *Leaflets* not very numerous, inequidistant, but not distinctly fascicled, narrowly lanceolate or subensiform, the largest up to 32 cm. long and 2 cm. broad with 3 or almost 5 costulæ, these smooth on both surfaces. *Male spadix* spuriously axillary (in one specimen), slender, almost quite unarmed, partially supradecompound, 1·4 m. long, terminated by a spikelet; partial inflorescences few, 12–20 cm. long, attached outside the mouth of their respective spathes; simple spikelets 2–2·5 cm., long, arched subscorpioid, with 6–12, not exactly flatly bifarious flowers on each side.

The Malayan Peninsula.

152. *C. neglectus* Becc.—Apparently scandent and rather slender. *Leaves* terminated by a slender cirrus. *Leaflets* inequidistant, linear-lanceolate, unicostate, the largest 18–20 cm. long, 10–13 mm. broad; the costa and one slender nerve on each side of it sprinkled with fulvous bristles above, underneath the midcosta only closely hairy; margins ciliate. *Female spadix* with several rather approximate partial infloresecences, which arise erect from or a little above the mouth of their own spathe and then are arched, spreading; spikelets arched, inserted just above the mouth of their own spathe, 6-7 cm. long, with 8–10 distichous rather remote flowers on each side. *Fruiting perianth* subpedicelliform. *Fruit* ovoid-elliptic, long-beaked. *Scales* not or very faintly channelled along the middle. *Seed* deeply pitted.

The Malayan Peninsula.

153. C. bubuensis Becc.—Slender and apparently scandent. *Sheathed stem* about 12 mm. in diam. *Leaves* about 55 cm. long in the pinniferous part, terminated by a slender cirrus; petiole about 7 cm. long. *Leaflets* not very numerous, irregularly grouped, linear-lanceolate, 3-costate; the costæ smooth on both surfaces; margins smooth. *Male spadix* simply decompound, rigid, straight, shorter than the leaves, not flagelliferous, quite unarmed; spikelets 2–2·5 cm. long with 7–8 flatly bifarious, not very approximate, 4 mm. long, flowers.

The Malayan Peninsula.

154. C. viridispinus Becc.—Scandent, slender. *Leaf-sheaths* 8–15 mm. in diam., armed with flat greenish or schistaceous spines. *Leaves* up to ·9 m. long in the pinniferous part; petiole more or less elongate. *Leaflets* rather numerous, 3-costate, linear-lanceolate, very long-acuminate, 2–6 approximate on each side of the rachis and on one plane (not pointing to different directions) and with long vacant spaces interposed; the costæ smooth or very sparingly bristly above, quite smooth beneath; margins smooth or nearly so. *Male* and *female spadices* almost similar, both simply decompound, flagelliform, ending in a filiform unarmed appendix. *Male spikelets* spreading, 4–6 cm. long, with 15–18 perfectly bifarious flowers on each side. *Female spikelets* strongly deflexed and conspicuously callous at their axilla, 5–10 cm. long, with 5–11 flowers on each side. *Fruiting perianth* campanulate, slightly pedicelliform. *Fruit* obovate, distinctly beaked, 11 mm. long, 6 mm. broad. *Scals* in 12 series, slightly channelled. *Seed* ovoid-elliptic, smooth; albumen equable; embryo lateral.

The Malayan Peninsula.

C. viridispinus var. *sumatranus* Becc.—*Leaflets* much less acuminate than in the type and sometimes almost obtuse at the apex.

Sumatra.

155. C. mucronatus Becc.—*Sheathed stem* 4–6 mm. in diam., smooth or armed with a few broad spines. *Leaves* small, 15–30 cm. long in the pinniferous part, terminated by a very slender cirrus; petiole very short. *Leaflets* very few, 8–9 on each side of the rachis, very inequidistant, oblanceolate, suddenly mucronate, plicate-5-costulate; the costæ and margins quite smooth. *Male spadix* smooth on every part, shorter than the leaves, simply decompound, with very few very small partial inflorescences; primary spathes unarmed, smooth; spikelets very short, circinate-scorpiod and 5–10 mm. long, with very closely packed flowers.

Borneo.

156. C. asperrimus Bl.—Scandent. *Leaf-sheaths* 7–20 mm. in diam., very scabrid and densely prickly. *Leaves* about 60 cm. long in the pinniferous part, terminated by a very slender cirrus; the petiole quite obsolete. *Leaflets* 8–10 on each side of the rachis, very inequidistant, narrowly lanceolate, gradually acuminate, unicostate, sometimes with one rather distinct secondary nerve on each side of the mid-costæ, all nerves smooth on both surfaces; margins spinulous. *Male* and *female spadices* with primary and secondary spathes scabrid. *Male spikelets* circinate-scorpioid. *Female spikelets* spreading, slightly arched, about 4 cm. long, with 8–10 distichous very approximate, 4 mm. long flowers on each side. *Fruit* ovoid, stoutly beaked. *Scales* in 18–20 series.

Java.

157. *C. erioacanthus* Becc.—Scandent, slender. *Leaf-sheaths* 7–12 mm. in diam., densely covered with flat, 1 cm. long spines, which are fringed-furfuraceous on the margins. *Leaves* 40–70 cm. long in the pinniferous part; the cirrus about as long; petiole 6–14 cm. long. *Leaflets* 13–14 in all, grouped in 4 remote fascicles, green and subconcolorous on both surfaces, lanceolate or oblanceolate, suddenly mucronate, almost flat or slightly concave-convex, 18–25 cm. long, 2·5–5 cm. broad, rather sharply 3-costulate; the costæ and margins quite smooth.

Borneo.

158. *C. optimus* Becc.—Slender, scandent. *Leaf-sheaths* armed with robust, large, laminar spines. *Leaves* 70–80 cm. long in the pinniferous part, the cirrus up to 1 m. in length; petiole 6–12 cm. long. *Leaflets* 6–8 in all, solitary and very distant on each side of the rachis, oblanceolate or oblong-lanceolate or subspathulate, somewhat concave-convex, the largest 32–35 cm. long, 5·5–6 cm. broad, green above, whitish or mealy underneath, with 4–6 slender but sharp costæ, which are smooth on both surfaces; margins spinulous.

Borneo.

159. *C. cæsius* Becc.—Scandent, slender. *Leaf-sheaths* 13–18 mm. in diam., armed with strong, flat, subulate spines. *Leaves* 60–80 cm. long in the pinniferous part; the cirrus about 1 m. long; petiole almost obsolete. *Leaflets* 16–24 in all, very irregularly set, usually paired, the pairs 15–20 cm. apart on each side of the rachis, more or less concave-convex, oblong-lanceolate, green above, conspicuously mealy-glaucous beneath, with 4–5 quite smooth costæ; margins spinulous. *Female partial inflorescences* 50 and more cm. long, with about 6 spikelets on each side; these vermicular, spreading, 10–12 cm. long, with 10–12 flowers on each side. *Fruiting perianth* pedicelliform. *Fruit* ellipsoid-ovoid, narrowly beaked, 18 mm. long, 12 mm. broad. *Scales* in 18 series, deeply and narrowly channelled. *Seed* ovoid, minutely pitted; albumen not very deeply ruminate; embryo lateral near the base.

Borneo and the Malayan Peninsula.

160. *C. simplex* Becc.—Scandent, rather slender. *Leaf-sheaths* 1–2 cm. in diam. *Leaves* 0·8–1·5 m. long in the pinniferous part; the cirrus long and slender; the petiole 15–20 cm. long. *Leaflets* about 10 in all, solitary and very distant on each side of the rachis, lanceolate or elliptic-lanceolate, up to 60 cm. long, 10 cm. broad, 5–6-costate; costæ and margins quite smooth. *Male* and *female spadices* very much the same, elongate, shorter than the leaves, very simple, with very few spikelets on each side of the main axis. *Male spikelets* spreading, arched, 12–13 cm. long, with 15–16 rather remote flatly bifarious flowers on each side. *Female spikelets* spreading, arched, 6–7 cm. long with 10–12 flowers in all, which are arranged in two slightly assurgent series. *Fruiting perianth* pedicelliform. *Fruit* globose-ovoid, large, about 3 cm. long, 2 cm. broad. *Scales* in 24 series, slightly channelled. *Seed* globular, minutely pitted; albumen very deeply ruminate; embryo almost basilar.

The Malayan Peninsula.

161. C. Doriæi Becc.—Apparently rather large and scandent. *Female spadix* with rigid, arched, partial inflorescences, which terminate in a slender barely spinulous tail-like appendix; spikelets spreading, callous at their axilla, arched, zig-zag sinuous, up to 6 cm. long, with 7–9 horizontal flowers on each side. *Fruiting perianth* depressedly ventricose. *Fruit* elongate-ellipsoid, stoutly beaked, 22–25 mm. long, 11–12 mm. broad. *Scales* in 21 series, narrowly and deeply channelled. *Seed* oblong-subcylindraceous, pitted; albumen superficially ruminate; embryo subbasilar.

Burma.

162. C. polydesmus Becc.—Scandent, apparently rather robust. *Leaflets* very distinctly grouped in fascicles of 2–3 on each side of the rachis, linear-lanceolate, acuminate, 20–22 cm. long, 18–25 mm. broad, sub-5-costulate, the costæ quite smooth on both surfaces; margins spinulous-serrulate. *Female spikelets* spreading, callous at their axilla, about 10 cm. long with 9 distichous flowers on each side, otherwise very similar to those of *C. Doriæi. Fruiting perianth* cylindraceous.

Burma.

163. C. khasianus Becc.—High, scandent and very robust. *Leaf-sheaths* 5 cm. in diam., armed with very large laminar spines. *Leaves* very large; petiole very short. *Leaflets* numerous, 2–4 approximate on each side of the rachis, with long vacant spaces interposed, lanceolate-ensiform, 40–50 cm. long, 2·5–3·5 cm. broad, 3–5-costulate, the costæ almost smooth on both surfaces or sparingly spinulous above; margins spinulous. *Female spadix* diffuse, 1·2–1·5 m. long, with many partial inflorescences, which are arched and spreading with a distinct callus at their axilla; spikelets zig-zag sinuous, up to 20 cm. long, with 15–16 flowers on each side; spathels asymmetrically infundibuliform. *Fruiting perianth* cylindraceous. *Fruit* almost sphæric, 26–27 mm. long. *Scales* in 18 series, deeply channelled. *Seed* globular, coarsely pitted; albumen superficially ruminate; embryo basal.

North-East India.

164. C. nambariensis Becc.—Scandent, rather robust. *Leaf-sheaths* 3–4 cm. in diam., armed with large, broad, subseriate, horizontal or deflexed spines intermingled with smaller ascendent ones. *Leaves* 3 mm. long in the pinniferous part; petiole very short. *Leaflets* very spreading, remotely subequidistant, lanceolate-ensiform, as much as 50 cm. long, 4 cm. broad, with 3 or sometimes 5 slender quite smooth costæ; margins obsoletely spinulous. *Male spadix* simply decompound or partially supradecompound; spikelets callous at their axilla, spreading or deflexed, 3–4 cm. long, with 14–18 very approximate, 3 mm. long, flowers on each side; spathels very closely packed, concave, ovate, bracteiform. *Fruit* apparently similar to that of *C. khasianus*, but more ovoid and with scales in 21 series.

North-East India.

165. C. inermis J. Ander.—High scandent and robust. *Leaf-sheaths* 5–6 cm. in diam., quite smooth. *Leaves* about 3 m. long in the pinniferous part; the cirrus 2 m. long, very robust and very powerfully clawed; petiole short, smooth. *Leaflets* numerous, inequidistant, in pairs on each side of the rachis, 3–9-costulate, the lower ones ensiform, 40–50 cm. long, 3–4 cm. broad, the others shorter and broader, lanceolate, as much as 6 cm. in width; the costæ smooth on both surfaces; margins spinulous. *Female spadix* strict, about 1 mm. long; partial inflorescences and spikelets not callous in their axilla; spikelets inserted inside the mouth of their spathe, 8–10 cm. long, with 8–10 flowers on each side, zig-zag sinuous between the flowers. *Fruiting perianth* ventricose. *Fruit* ellipsoid, 27–29 mm. long, 13–14 mm. broad. *Scales* in 18 series, deeply channelled. *Seed* ovoid, sinuously grooved.

North-East India.

166. *C. Manan* Miq.—Scandent, very large. *Leaf-sheaths* 7–8 cm. in diam., fearfully armed with short triangular spines. *Leaves* about 5 m. long in the pinniferous part; the cirrus very robust and strongly clawed, 3 m. long. *Leaflets* very large, numerous, subequidistant, lanceolate or broadly ensiform, up to 70 cm. long, 5 cm. broad, plicate, many-nerved, with the mid-costa only prominent, the side nerves slender, smooth and almost concolorous on both surfaces; margins spinulous. *Female spadix* forming a very large panicle, shorter than the leaves; spikelets large, arched, rigid, their axis cylindraceous, up to 25 cm. in length, with 15–16 bifarious, 5–6 mm. long, remote flowers on each side. *Fruiting perianth* cylindraceous. *Fruit* broadly ovoid-elliptical, 3–3·5 cm. long, 20–22 mm. broad. *Scales* in 15–18 series, superficially channelled. *Seed* ovoid, minutely tubercled and pitted; albumen ruminate; embryo lateral.

Sumatra.

167. *C. giganteus* Becc.—Scandent and very robust. *Leaf-sheaths* 4-7 cm. in diam., powerfully armed with large laminar spines. *Leaves* 2·5-3 m. long; petiole prickly. *Leaflets* numerous, apparently subequidistant, 6–8 cm. apart, green above, sub-glaucescent beneath, plicate-5-costate, broadly ensiform, 55–60 cm. long, 3–4 cm. broad, the costæ and margins quite smooth. *Male spadix* ultradecompound; spikelets small, 19–20 mm. long with 5–10 very approximate flatly bifarious flowers on each side. *Female spadix* very large and diffuse; spikelets robust, rigid, somewhat flattened, arched and deflexed, 10–16 cm. long with 14–18 flowers on each side. *Fruiting perianth* cylindraceous, slightly inflate at the base. *Fruit* ovoid elliptical, 28 mm. long. *Scales* in 15 series, rather deeply channelled.

The Malayan Peninsula.

168. *C. platyacanthus* Warb.—Robust, scandent. *Leaf-sheaths* apparently 4–5 cm. in diam., armed with enormous laminar spines, of which some are as much as 8–9 cm. long and 10–15 mm. broad. *Leaves* very large; petiole flat and prickly above. *Leaflets* large, concave-convex, oblong or oblanceolate, 43 cm. long, 8–9 cm. broad (in one specimen) with 5 costæ and 2–3 secondary nerves between each of them; the costæ acute, smooth or sparingly spinulous above, slender and smooth beneath. *Female spadix* about 60 cm. long, with a few diffuse partial inflorescences; spikelets spreading or deflexed, the lower ones 8 cm. long with 9-10 flowers on each side, the upper ones shorter, strongly zig-zag sinuous between each flower. *Fruiting perianth* cylindraceous. *Fruit* ovoid-elliptical, suddenly beaked, 22 mm. long, 13–14 mm. broad. *Scales* in 18 series, deeply channelled. *Seed* ovoid-oblong, boldly tubercled and strongly pitted, with a narrow and deep chalazal fovea; albumen slightly ruminate; embryo basal.

Tonkin.

169. C. albus Pers.—Scandent and rather robust. *Leaf-sheaths* 2–5 cm. in diam., densely armed with small acicular spines. *Leaves* 2–3 m. long in the pinniferous part. *Leaflets* numerous, large, equidistant, 6–10 cm. apart, slightly concave-convex, lanceolate, 45–65 cm. long, 5–7 cm. broad, 5-costulate, the costæ more or less spinulous above, smooth underneath; margins spinulous, male spadix forming a large panicle about 2 m in length; spikelets small, 3–4 cm. long, with 12–15 approximate flowers on each side. *Female spadix* robust, 1·5 m. long (in one specimen) with many rather approximate partial inflorescences; spikelets very spreading, arched, up to 25 cm. in length, with 18–20 flowers on each-side, zig-zag sinuous between the flowers. *Fruit* globose-ovoid or obovoid, beaked, 18–19 mm. long, 12–14 mm. broad. *Scales* in 15 series, shining, faintly channelled, straw coloured. *Seed* boldly tubercled and deeply pitted; albumen coarsely ruminate; embryo basal.

Amboina.

170. C. pallidulus Becc.—*Leaf-sheaths* 13–20 mm. in diam., very thick, greenish or straw-yellowish like almost every other part of the plant when dry. *Leaves* 30–40 cm. long in the pinniferous part, terminating in a long and robust cirrus; petiole very short or obsolete. *Leaflets* very few, 4–5 on each side, inequidistant but not fascicled, ensiform or lanceolate, 20–25 cm. long, 15–20 mm. or at most 30–35 mm. broad, unicostate, smooth on both surfaces; margins spinulous. *Female spadix* panicled, diffuse; secondary spathes and spathels scabrid, spikelets spreading, vermicular, their axis cylindraceous, slender, up to 10 cm. long, with about 10 flowers on each side. *Fruiting perianth* slightly ventricose at the base. *Fruit* sphæric, 18 mm. in diam. *Scales* in 15–18 series, superficially channelled. *Seed* globular-ovoid, deeply pitted; albumen deeply ruminate; embryo sub-basal.

The Malayan Peninsula; Singapore.

171. C. macrosphærion Becc.—Apparently scandent and robust. *Female spadix* rigid and robust; partial inflorescences short and rigid, 25 cm. long and with 5 spikelets on each side (in one specimen); spikelets inserted above the mouth of their own spathe, distinctly callous at the axilla, 4–4·5 cm. long, with 8–9 approximate flowers on each side. *Fruiting perianth* distinctly pedicelliform. *Fruit* sphæric, about 2 cm. in diam., very shortly mammillate. *Scales* in 15 series, convex, narrowly channelled. *Seed* globular, minutely tubercled; albumen very deeply ruminate; embryo on the face opposite the chalazal fovea.

Celebes.

172. C. mattanensis Becc.—Scandent, slender or of moderate size. *Leaf-sheaths* 12–17 mm. in diam., very thick, light-coloured like the other parts of the plant, armed with strong, flat, narrowly lanceolate spines. *Leaves* about 1 m. long in the pinniferous part, terminated by a not very robust cirrus; petiole about 25 cm. long. *Leaflets* not very numerous (8–9 on each side), more or less approximate into a few groups, linear-ensiform, up to 32–38 cm. long, 2–3 cm. broad, unicostate, longitudinally plicate, quite smooth on both surfaces; margins spinulous.

Borneo.

173. C. Oxleyanus Becc.—Erect or later scandent. *Leaf-sheaths* not flagelliferous, open on the ventral side. *Leaves* 3–3·5 m. long in the pinniferous part, terminated by a robust strongly clawed cirrus; petiole very long (50–60 cm.). *Leaflets* numerous, linear-lanceolate, 20–30 cm. long, 18–20 mm. broad, 3-sub-5-costulate, very conspicuously approximate in groups of as many as 10–12 on each side of the rachis, with long vacant spaces interposed, equidistant in each group and all in one plane (not pointing to different directions). *Male spadix* about 1 m. long; spikelets spreading, 2–3·5 cm. long, with 10–16 horizontal, flatly bifarious flowers on each side. *Female spadix* with many diffuse partial inflorescences; spikelets with a vermicular cylindraceous axis, as much as 18–20 cm. long with the flowers about 1 cm. apart on each side. *Fruiting perianth* shortly pedicelliform. *Fruit* globular, about 1 cm. in diam., narrowly and conspicuously beaked. *Scales* in 12 series, superficially channelled. *Seed* irregularly globular, wrinkled; albumen equable.

The Malayan Peninsula, Singapore, Bangka.

174. C. microsphœrion Becc.—Scandent, slender. *Leaf-sheaths* about 15 mm. in diam., quite unarmed. *Leaves* about 80 cm. long in the pinniferous part; the cirrus slender; petiole 8–20 cm. long. *Leaflets* pointing in different directions in groups of 2–4 on each side of the rachis, the groups 5–10 cm. apart, narrowly lanceolate, 20–30 cm. long, 15–20 mm. broad, with 3 or sometimes 5 costæ, these smooth on both surfaces. *Female spadix* simply decompound; spathes closely sheathing, spikelets 5–6 cm. long, with 10-12 flatly bifarious horizontal flowers on each side. *Fruiting perianth* distinctly pedicelliform. *Fruit* very small, sphæric, 3·5–4 mm. in diam. *Scales* in 18 series, slightly channelled.

The Philippines.

175. C. ramulosus Becc.—Scandent. *Leaf-sheaths* about 2 cm. in diam., armed with subulate spines. *Leaves* about 1 m. long in the pinniferous part; the cirrus slender; petiole obsolete. *Leaflets* in groups of 3–5 on each side of the rachis, the groups 3–7 cm. apart, linear, 20–21 cm. long, about 1 cm. broad, sub-3-costulate, smooth on both surfaces. *Female spadix* ultradecompound, with several much branched, diffusedly pyramidate, partial inflorescences; spathes closely sheathing; spikelets very slender, 4–5 cm. long with 5–7 flowers on each side. *Fruit* very small, about 4 mm. in diam., globular, beaked. *Scales* in 15 series, not channelled.

The Philippines.

176. C. unifarius Becc.—Scandent, robust. *Leaf-sheaths* 3–3·5 cm. in diam., armed with long acicular bulbous spines. *Leaves* large, 1·7 m. long in the pinniferous part. *Leaflets* not very numerous, subequidistant, 6–10 cm. apart, lanceolate or lanceolate-ensiform, with 5–7 slender costæ, these smooth on both surfaces. *Male spadix* ultradecompound with several panicled-pyramidate partial inflorescences; spikelets distinctly callous in the axilla, very slender, arched, their axes filiform, 1–3 cm. long, with 5–15 distichous flowers on each side; involucre calyculiform, subtending and not enveloping its flower. *Female spadix* simply decompound, similar to the male one; spikelets slender, 5–8 cm. long with 15–20 bifarious flowers on each side; involucrophorum very short, explanate, callous at its axilla. *Fruiting perianth* small, pedicelliform. *Fruit* globose, 1 cm. in diam. *Scales* subsquarrose in 15 series, not distinctly channelled. *Seed* irregularly globular, coarsely pitted; albumen subruminate, embryo basal.

Java.

C. unifarius var. *Pentong* Becc.—Involucrophorum more or less distinctly pedicellate.

The Nicobar Islands.

177. C. subinermis H. Wendl.—Robust. *Leaf-sheaths* 4 cm. in diam., thick and woody, quite unarmed. *Leaves* large, 2·5 m. long in the pinniferous part; the cirrus robust; petiole 12 cm. long, 15 mm. broad, armed only at the margins with tuberculiform spines. *Leaflets* 16–17 on each side of the rachis, 10–15 cm. apart, subequidistant, elongate-lanceolate, plicate, many-nerved, with 5 bristly spinulous costæ above, underneath smooth; margins ciliate-spinulous.

Borneo.

178. C. pisicarpus Bl.—Scandent, robust. *Leaf-sheaths* 2·5 cm. in diam., armed with long straight spines. *Leaves* large, 1·5 m. long in the pinniferous part; the cirrus 2·5–3 m. long; petiole very short. *Leaflets* scattered, lanceolate, 35–40 cm. long, about 9 cm. broad, plicately many-costate, the mid-costa bristly spinulous. *Fruit* pisiform.

Amboina.

179. C. aruensis Becc.—Scandent, robust. *Leaf-sheaths* 3–4 cm. in diam., quite smooth. *Leaves* about 4 m. long in the pinniferous part; petiole obsolete; rachis quite smooth above from its base. *Leaflets* about 15 on each side, 10–15 cm. apart, equidistant, broadly lanceolate, up to 40–50 cm. long, 7·5–8 cm. broad, with 5 primary costæ and many distinct secondary nerves, all smooth on both surfaces. *Female spadix* rigid and straight with not many, strongly arched, partial inflorescences; spikelets arched, their axis narrowly cylindraceous, 8–9 cm. long, with 20–25 horizontal flowers on each side; involucrophorum shortly stalked. *Fruit* small, pisiform. *Scales* in 15 series, faintly channelled.

Aru Islands.

180. C. Hollrungii Becc.—Scandent, rather robust. *Leaves* large, the rachis prickly above. *Leaflets* not very numerous, subequidistant, 6–10 cm. apart, broadly lanceolate, with 5 primary costæ and many distinct secondary nerves, all smooth on both surfaces, the mid-costa only occasionally spinulous above near the base. *Female spadix* elongate, with several strongly arched diffuse partial inflorescences; spikelets 10–12 cm. long, with 20–25 flowers on each side; involucrophorum shortly stalked. *Fruit* small, pisiform; scales in 15 series.

German New Guinea.

181. C. Vidalianus Becc.—Apparently scandent and of moderate size. *Leaf-rachis* densely prickly above. *Leaflets* subequidistant, 3–5 cm. apart, narrowly ensiform, 30–32 cm. long, 15–20 mm. broad, with 3 very distinct costæ which are bristly spinulous above and smooth underneath; margins conspicuously spinulous. *Female spadix* diffuse, terminating in a small tail-like prickly appendix; secondary spathes unarmed, elongate-infundibuliform, closely sheathing; spikelets spreading, arched, 5–7 cm. long, with about 6 rather distant 5 mm. long, sometimes geminate flowers on each side; areola of the neuter flower conspicuous, subinvolucriform.

The Philippines.

182. *C. pachystachys* Warb.—Robust, scandent. *Leaves* rather large; the cirrus robust; rachis prickly above. *Leaflets* rather numerous, equidistant, about 4 cm. apart, longitudinally plicate, narrowly lanceolate; 20–25 cm. long, 2–2·5 cm. broad, with the mid-costa sparingly bristly above, smooth beneath; side-nerves slender and smooth on both surfaces; margins conspicuously ciliate. *Female spadix* robust, with rather large partial inflorescences; spikelets strongly arched, their axis thick, subterete, vermiform, the largest about 15 cm. long, with 7 pairs of female flowers on each side, the spathels usually subtending two equally evolute female flowers. *Fruit* subglobose-ovoid or subturbinate, suddenly conically beaked, 15–17 mm. long, 10–12 mm. broad. *Scales* shining, in 17–18 series, strongly convex, deeply channelled. *Seed* globular, deeply ruminate.

Celebes.

183. *C. didymocarpus* Warb.—Robust, scandent. *Leaves* large, the cirrus robust, up to 2 m. in length. *Leaflets* lanceolate-ensiform, longitudinally plicate, 8–10 cm. apart, 40 and more cm. long, 4 cm. broad, the mid-costa sparingly bristly above, smooth beneath; secondary nerves slender and smooth on both surfaces; margins spinulous. *Female spadix* large and diffuse, with long nodding or pendulous partial inflorescences which carry 6–7 rather distant spikelets on each side; spikelets vermicular, up to 25 cm. long with 15–20 pairs of female flowers on each side, usually the spathels subtending two equally evolute female flowers. *Fruit* subglobose-ovoid or subturbinate, suddenly topped by a 2 mm. long cylindraceous beak. *Scales* in 15 series, strongly convex, shining, deeply channelled. *Seed* globular; albumen deeply ruminate.

Celebes.

184. *C melanoloma* Mart.—Slender, scandent. *Leaf sheaths* 7 12 mm. in diam., armed with scattered spines. *Leaves* small, 30–50 cm. long in the pinniferous part; the cirrus slender; petiole short or very short. *Leaflets* 10–20 in all, 10–12 cm. long, 1·5–2·5 cm. broad, usually in remote pairs on each side of the rachis, lanceolate or oblanceolate, 3-or sub-5-costulate, smooth on both surfaces. *Male* and *female spadices* very similar, very simple, with a few spikelets on each side of the main axis; spikelets 5–6 cm. long, with few distant spreading flowers on each side. *Fruit* elongate-ellipsoid, distinctly beaked, 18–21 mm. long, 10–15 mm. broad. *Scales* in 15–18 series, faintly channelled, straw coloured with a black marginal line and tip. *Seed* narrowly oblong, deeply pitted; albumen subruminate; embryo basal.

Java.

185. *C. siphonospathus* Mart.—Scandent. *Leaf-sheaths* 2–4 cm. in diam., more or less armed with slender acicular spines. *Leaves* (of the upper part of the adult and fertile plant) 1 m. and more long in the pinniferous part with a cirrus about as long; petiole rather long. *Leaflets* numerous, equidistant or nearly so, linear or linear-lanceolate, 20–35 cm. long, 10–18 mm. broad, with 3–5 bristly costæ. *Male spadix* ·6–1 m. long, narrow, terminating in a subulate smooth tail-like apex, with several small partial inflorescences, each issuing from a tubular, very loosely sheathing or rather inflate spathe; spikelets with a very slender, filiform. zig-zag sinuous axis, 10–15 mm. long, with 8–10 flowers in all. *Female spadix* similar to the male one,

but with larger, twice branched, rather dense, partial inflorescences; spikelets 3–4 cm. long with 8–12 flowers on each side. *Fruiting perianth* pedicelliform. *Fruit* very small, ovoid or sub-ovoid, obtusely beaked, 6 mm. long, 3·5–4 mm. broad. *Scales* in 12–18 series, convex, not channelled along the middle.

The Philippines.

C. siphonospathus (typus).—*Leaf-sheaths* armed with slender, light-coloured spines petiole and lower part of the rachis prickly on both surfaces. *Leaflets* very narrow with 3 bristly costæ. *Spathes* aculeolate. *Partial inflorescences* much branched and very dense. *Fruit-scales* in 15 series.

C. siphonospathus var. *sublevis* Becc.—*Leaf-sheaths* smooth or nearly so; petiole and lower part of the rachis prickly on both surfaces. *Leaflets* very narrow, with 3 smooth or sparingly spinulous costæ. *Spathes* smooth. *Fruit scales* in 15 series.

C. siphonospathus var. *oligolepis major)* Becc.—*Leaflets* very narrowly lanceolate with 5 bristly costæ. *Spathes* aculeolate. *Fruit-scales* in 12 series.

C. siphonospathus var. *oligolepis* (*minor*) Becc.—Slender. *Leaflets* smaller, with 3 bristly costæ. *Fruit scales* in 12 series.

C. siphonospathus var. *polylepis* Becc.—*Leaflets* linear, with 3 bristly spinulous costæ. *Spathes* aculeolate. *Partial inflorescences* very dense. *Fruit scales* in 18 series.

186. C. microcarpus Becc.—Scandent. *Leaf-sheaths* 2–2·5 cm. in diam.; armed with elongate often confluent spines. *Leaves* 1·5 m. long in the pinniferous part; petiole elongate, prickly all round. *Leaflets* approximate in groups of 3–7, 5–15 cm. apart, on each side of the rachis, equidistant and pectinate in each group, linear. lanceolate, 20–30 cm. long, 12–20 mm. broad, 3-sub-5-costulate. *Female spadix* strict, about 50 cm. long; primary spathes slightly inflated; spikelets with a slightly zig-zag sinuous, cylindraceous, filiform axis, 4–5 cm. long, with 10–12 horizontal flowers on each side. *Fruit* very small, globose, 6–7 mm. in diam., shortly conically beaked. *Scales* in 12 series, very deeply channelled, gibbous near the apex.

The Philippines.

187. C. dimorphacanthus Becc.—Slender, scandent. *Leaf-sheaths* about 2 cm. in diam., very densely armed with long acicular spines. *Leaves* 60 cm. or more long in the pinniferous part; the cirrus about as long; petiole short, armed like the greatest part of the rachis, especially on the upper surface, with very unequal horizontal spines, of which some in the leaves of young plants are very long and needle-like; the rachis in its upper part armed beneath with half whorls of very robust claws. *Leaflets* numerous, subequidistant, very narrowly linear, 10–22 cm. long, 3–5 up to 8–10 mm. broad, unicostate; margins conspicuously ciliate. *Spadices* very similar to those of *C. siphonospathus*, very strict, with loosely sheathing, subinflate spathes. *Fruit* ovoid, obtusely apiculate, 8–9 mm. long, 5·5–6 mm. broad. *Scales* in 18 series, shining, convex, slightly channelled near their base.

The Philippines.

188. C. conirostris Becc.—Scandent, of moderate size. *Leaf-sheaths* densely armed with short and long spines. *Leaves* large, 1·8–2·5 m. long in the pinniferous part; the cirrus short and robust; petiole rather long. *Leaflets* numerous, equidistant, linear–ensiform, green on both surfaces, 3-costate, about 45 cm. long, 25–28 mm. broad. *Male* and *female spadices* very similar, with a short peduncular part and only one or two densely panicled, thyrsoid, partial inflorescences and a long clawed terminal flagellum; primary spathes tubular in their lower part, subventricose and auriculiform upwards; spikelets scorpioid; the flowers very closely packed, and disposed in two assurgent series. *Fruiting perianth* campanulate. *Fruit* ovoid at the base, gradually attenuate to a large conic beak, 3 cm. long, 15 mm. broad. *Scales* in 15 series, very adpressed, convex, not channelled, almost black. *Seed* ovoid, finely tubercled; albumen ruminated; embryo nearly basal.

The Malayan Peninsula.

189. C. Lobbianus Becc.—Erect, 2–2·5 m. high. *Leaf-sheaths* open on the ventral side, densely armed with short and long spines. *Leaves* 1·8–2 m. long, non-cirriferous; the petiole very long. *Leaflets* numerous, equidistant, ensiform or lanceolate-ensiform, green above, white unddeneath. *Male* and *female spadix* very similar, with only one or two approximate and dense partial inflorescences at the summit of a long peduncular part; primary spathes persistent. fusiform or elongate-ventricose; spikelets very short and dense; flowers about 1 cm. long. *Fruit* ovoid at the base, gradually attenuated to a large conic beak, about 2 cm. long. *Scales* shining, black, in 15 series, slightly convex, not channelled.

The Malayan Peninsula and Singapore.

190. C. brachystachys Becc.—*Female spadix* very short, composed of only one, compact, oblong, partial inflorescence, and terminated by a short tail-like appendix; the spathe enveloping the inflorescence, lanceolate, concave-auriculiform, prickly, spikelets very short, scorpioid, with very closely packed, rather large (1 cm. long) flowers. *Fruit* elongate-ovoid, narrowing towards both ends, 3·5 cm. long, 1·5 cm. broad. *Scales* quite black, in 15 series, convex, not channelled. *Seed* ovoid-elliptic; albumen deeply ruminated; embryo basal.

Borneo.

191. C. Henryanus Becc.—Scandent, slender. *Leaflets* inequidistant, linear-ensiform, 32–37 cm. long, 14–16 mm. broad, with the mid-costa and two nerves on each side of it more or less spinulous on both surfaces. *Female spadix* very strictly panicled, with very adpressed and slender partial inflorescences; spikelets furnished with a peduncular part which is included in their respective spathes, erect, very adpressed to the axis: the lower ones 8–9 cm. long, with many distichous flowers on each side: the upper ones gradually shorter: the uppermost with only 2–3 flowers on each side. *Female flowers* 4 mm. long, erect in the involucre and adpressed to the axis of the spikelet. *Neuter flowers* pedicellate. *Fruiting perianth* explanate. *Fruit* obovate, suddenly beaked, 12 mm. long. *Scales* faintly channelled along the middle.

China.

192. C. thysanolepis Hance.—Stemless, erect. *Leaves* non-cirriferous, ·8–1·2 m. long. *Leaflets* ensiform, 30–37 cm. long, 15–20 mm. broad, approximate in groups of 2–6 on each side of the rachis and pointing to different directions. *Female spadix* not flagelliferous, unarmed; primary spathes loosely sheathing, fibrous-dilacerate; spikelets about 7 cm. long, very dense-flowered. *Fruiting perianth* distinctly pedicelliform. *Fruit* broadly ovoid-ellipsoid, shortly conically beaked, 15 mm. long. *Scales* in 18 series, not channelled along the middle. *Seed* ellipsoid, obscurely tubercled; albumen equable; embryo basal.

Hong-Kong.

193. C. *ferrugineus* Becc.—Scandent. *Leaves* cirriferous. *Leaflets* narrowly lanceolate, not numerous, remotely opposite, strongly deflexed, each furnished at the base with an ascendent small spine. *Female spadix* rather short, with very few, short, partial, subscorpioid inflorescences, non-flagelliferous; primary spathes fringed at the mouth; spikelets subscorpioid with 4 series of assurgent flowers (not flatly bifarious), two of the series being of neuter rather large flowers. *Fruit* broadly ovoid, conically beaked, 9–10 mm. long, 6 mm. broad. Leaf-sheaths, petiole, leaf-rachis, axial parts of the spadix and spathes covered at first with a rusty deciduous scurf, which later leaves the surface of those organs minutely scabrid.

Borneo.

194. C. *Kunzeanus* Becc.—*Fruiting perianth* explanate. *Fruit* obovoid, round at both ends, not beaked, 1 cm. long, 8 mm. broad. *Scales* very few, in 12 series, loosely imbricate, convex, slightly channelled. *Seed* ellipsoid with unequal surface; albumen equable; embryo in the centre of the face opposite to the chalazal fovea.

Cambodia.

195. C. *Lauterbachii* Becc.—Scandent, rather slender. *Leaf-sheaths* armed with very small spines and apparently furnished with a large ocrea at its summit. *Leaves* non-cirriferous, short, about 40 cm. long. *Leaflets* very few, 12 in all and with a bilobed one at the summit (in one specimen), approximate in 3 groups, lanceolate or oblong-lanceolate, concave-convex, the largest 18–20 cm. long, 4 cm. broad, with a rather strong mid-costa and 2–3 slender nerves on each side of it; all nerves smooth on both surfaces; margins spinulous. *Male spadix* about as long as the leaves, dense, with 4 compact, cupressiform, partial inflorescences; spikelets short and thick, 1–2 cm. long, with very closely packed and apparently pluriseriate (not bifarious) rather large (5 mm. long) flowers.

German New Guinea.

196. C. *fertilis* Becc.—*Female spikelets* 15–18 cm. long, their axis rigid, vermicular-cylindraceous, composed of 20–24 tubular-infundibuliform spathels, with two perfectly evolute and about 5 mm. long female flowers at each spathel. *Fruiting perianth* explanate. *Fruit* ovate, suddenly beaked, 16 mm. long, 10–11 mm. broad *Scales* in 18 series, narrowly and neatly channelled. *Seed* subglobular, irregularly pitted; albumen equable; embryo basal.

British New Guinea.

197. C. *Macgregorii* Becc.—Scandent. *Leaves* non-cirriferous. *Leaflets* numerous, slightly inequidistant, linear-ensiform, 3-costulate, the largest 30 cm. long, 2 cm. broad. *Female spadix* with several small, 16–20 cm. long, partial inflorescences which are inserted inside their respective spathes; spikelets short (3–4 cm. long), arched, with a pedicellar part which is attached to the bottom of their respective spathels

Fruiting perianth explanate. *Fruit* ovoid, 13–15 mm. long, 1 cm. broad. *Scales* in 18 series, straw-yellow, strongly gibbous, narrowly channelled. *Seed* ovoid, coarsely alveolate; albumen equable; embryo basal.

British New Guinea.

198. C. Hartmannii Becc.—Erect, 2·5–3 m. high. *Leaves* non-cirriferous, about 60 cm. long including the petiole, this 15 cm. long and feebly armed with hooked prickles. *Leaflets* not very numerous, inequidistant, usually in pairs on each side of the rachis, narrowly oblong or oblanceolate, slightly concave-convex, 3–5-costulate, smooth on both surfaces, the largest 14 cm. long, 3 cm. broad; transverse veinlets, very sharp and continuous across the blade, margins inconspicuously spinulous, terminal leaflet bilobed.

British New Guinea.

199. C. discolor Mart.—Not very high, scandent. *Leaf-sheaths* flagelliferous densely bristly. *Leaves* non-cirriferous, about 1 m. in length; petiole 15 cm. long, rachis rusty furfuraceous, armed with solitary approximate claws. *Leaflets* very numerous, spreading, pectinate, very closely and regularly set, green above, conspicuously white beneath, unicostate, linear-lanceolate, 20–30 cm. long, 18–24 mm. broad, with long bristles on 3 nerves above and on the mid-costa beneath; margins conspicuously ciliate. *Female-spadix* 1·1–1·3 m. long, erect, narrowly panicled, flagelliferous at its summit, with a few alternate partial inflorescences, these arched-subscorpioid, twice branched in their lower part; primary spathes split longitudinally and lacerate at the summit; spikelets with irregularly arranged flowers. *Fruit* small (not seen ripe), somewhat resembling that of the species of the group of *C. siphonospathus.*

The Philippines.

200. C. acidus Becc.—Erect. *Leaf-sheaths* densely armed with slender spines. *Female spikelets* 2–2·5 cm. long with two collateral assurgent series of 6 flowers each; involucre distinctly cupular. *Fruit* very closely packed, ovate, distinctly conically beaked, 15–17 mm. long, 10 mm. broad. *Seed* flattened, enveloped by an acid fleshy integument and with a distinct chalazal fovea.

Celebes.

201. C. (Zalaccella) Harmandi Pierre.—Apparently non-scandent. *Leaf-sheaths* open on the ventral side, armed with long seriate spines. *Leaves* apparently non-cirriferous. *Leaflets* numerous, equidistant, linear-ensiform, 30–40 cm. long, 10–15 mm. broad, tricostulate, the mid-costa strong and bristly and the side costæ slender and spinulous above, underneath all nerves quite smooth. *Female spadix* strict, with a few superposed partial inflorescences which are spiciform, cylindraceous, as thick as a man's finger, about 10 cm. long, covered all round with pluriseriate flowers. *Fruiting perianth* explanate. *Fruit* obovoid, 1 cm. long, very closely packed. *Scales* in 18 series, convex, not channelled. *Seed* pisiform; albumen equable.

Cochin-China.

III.—DETAILED DESCRIPTIONS OF SPECIES.

CALAMUS LINN.

CALAMUS ERECTUS Roxb. Fl. Ind. iii, 774; Mart. Hist. Palm. iii, 213 (first edit.) and 332; Griff. in Calc. Journ. Nat. Hist. v, 35 and Palms Brit. Ind. 43, pl. cxc A. f. i (as *C. acanthospathus*); Walp. Ann. iii, 483 and v, 829; Kurz in Journ. Asiat. Soc. Beng. xliii, pt. 2, 209, pl. xxiii and xxiv (excl. *C. longisetus* Griff.) and For. Fl. Brit. Burma ii, 516, and Rep. Veg. Pegu, 90; Hook. f. Fl. Brit. Ind. vi, 438 (excl. *C. schizospathus*); Becc. in Rec. Bot. Surv. Ind. ii, 197.

C. macrocarpus Griff. in Mart. Hist. Nat. Palm. 333, t. 176 f. x and t. Zxviii, f. xxiv; Griff Palms Brit. Ind. 40, pl. clxxxvi A, figs. i-ii; Walp. Ann. iii, 484 and v, 830.

C. erectus macrocarpus Becc. in Hook. f. Fl. Brit. Ind., vi, 439.

C. collinus Griff. in Calc. Journ. Nat. Hist. v, 31 and Palms Brit. Ind. 39 (excl. descr. leaf), t. clxxxv (spadix only); Mart. Hist. Nat. Palm. iii, 332; Walp. Ann. iii, 482 and v, 829.

C. erectus VAR. *β collina* Becc. in Hook. f. Fl. Brit. Ind. vi, p. 439.

DESCRIPTION.—Tufted, gregarious. *Stem* erect, 4–5 m. high, with internodes when divested of the sheaths 3–4 cm. in diam., green, smooth, 6–10 cm. long. *Leaf-sheaths* not flagelliferous, broadly opened on the ventral side (not completely tubular) and gradually passing into the petiole, densely and irregularly armed with long, large, flat and laminar spines. *Ocrea* very large, in full-grown leaves longitudinally split on the ventral side into two large oblong auricles (one on each side of the petiole), 5–7 cm. long, obtuse, densely covered with more or less distinct and transversely seriate lamellæ, and crested with dark, rigid, very numerous, confluent bristles. *Leaves* not cirriferous, very large, 3–5 m. in length; petiole sub-cylindric, rigid, erect, very long, armed with rather remote whorls or half-whorls of straight, 2–3 cm. long flat, elastic and deflexed spines, which are light at the base and dark-tipped; intermingled with these are other spines, solitary or disposed in smaller and incomplete series; rachis acutely angular and with two flat side-faces above, rounded beneath where it is armed in its first portion with half-whorled, and near the summit with solitary, laminar, deflexed, straight, never claw-shaped spines; leaflets very numerous, pale-green when dry, nearly shining above, dull and hardly paler beneath, equidistant, alternate or subopposite, 5–7 cm. apart, elongate-ensiform or narrowly lanceolate, subulately acuminate, somewhat alternate and deeply backwardly plicate or doubled at the base; their mid-costa stout and raised above, bearing mainly near the apex, on both surfaces, a few not very long spiny bristles; secondary nerves fine, rather numerous, inequidistant, not prominent, but frequently very distinct, naked on both surfaces; transverse veinlets very fine, crowded and interrupted; margins acute, spinulous-serrate from the middle upwards; the largest leaflets, the mesial, 60–75 cm. long, 3·5–4 cm. broad, the upper gradually shorter and less acuminate, or almost obtuse and bristly hispid at the apex; the two of the terminal pair, the smallest, confluent at the base and sometimes (probably in leaves of young plants) larger than usual and distinctly 2–3-costate. *Male spadix* nearly erect, attached laterally near the summit of the leaf-sheath, about 1 m. in length or sometimes longer, supradecompound near the base, simply decompound upwards, relatively compact, more or less scurfy-furfuraceous, bearing many partial inflorescences, not flagelliferous, but often produced into a caudate appendix formed by closely sheathing reduced aculeate and lacerate spathes; the attenuated axial portion of the spadix, between two partial inflorescences, short (8–12 cm. long), more or less armed on the outer side of the lower unsheathed portion with short, sometimes aggregate, straight deflexed and occasionally claw-shaped primary spines; spathes scurfy-furfuraceous; the lowest at first tubular, somewhat compressed, and rather elongated, speedily longitudinally split, much lacerated and fibrous, more or less armed with solitary or clustered, short, straight, slender, needle-like and deflexed spines, or nearly unarmed; upper primary spathes tubular, very loosely sheathing, exsuccous, rather thinly membranous, mostly quite unarmed or sparingly aculeate, with the limb always much lacerated and fibrous; partial inflorescences nodding or spreading, the largest, the lowest, 20–30 cm. long, twice branched, the succeeding gradually smaller, simply branched, with 5–10 simple spikelets on each side, the uppermost with 3–4 spikelets only; secondary spathes brown-furfuraceous, short, broadly infundibuliform, membranous, usually longitudinally split, obliquely truncate at the mouth and produced on one side into a lacerated tip; spikelets very large, 10–20 cm. long, spreading, more or less arched or flexuose, inserted inside nearly to the base of their own spathe, flattened, with 15–20 flowers on each side; terminal spikelet of each partial inflorescence usually longer than the others, with even 30–33 flowers on each side, larger than usual; spathels minutely furfuraceous, short, asymmetrically infundibuliform, truncate with subscarious margin and lacerated marcescent tip; involucre cupular, almost included in its own spathel at the base of the one above, irregularly split or broadly toothed on the margin. *Male flowers* very regularly bifarious in one plane, rather distant (2–4 mm. apart) and relatively large (8–10 mm. long, 3 mm. thick) inserted at an angle of 45°, almost entirely exserted from the spathels, narrowly oblong, acute, obscurely trigonous, straight or slightly curved or somewhat asymmetric, thinly and fugaciously scaly-furfuraceous; calyx nearly entirely exserted from the involucre, campanulate, divided down to the middle into 3 broad, ovate, apiculate, striately veined lobes, narrowly scarious at the margin; corolla (in full grown buds) a little more than twice or two and a half times as long as the calyx, divided down almost to the base into 3 lanceolate-oblong, acute, finely striate segments; stamens with flattened subulate filaments not inflected at the apex, connate at the base with the short undivided portion of the corolla; anthers versatile, large, broadly linear, not sagittate, somewhat curved, attenuate at both ends, their cells united almost to the base; rudimentary ovary slender, elongate, trigonous, with 3 subulate, abortive stigmas. *Female spadix* 1–1·5 m. long, erect or nodding, simply decompound, terminating in a depauperate spikelet or in a more or less evolute, filiform, feebly clawed or nearly unarmed appendix; axial attenuate unsheathed portion of the spadix, between two partial inflorescences, short, flat, or nearly concave on the inner side, more or less armed on the back with scattered or aggregated hooked aculei; partial inflorescences not very remote, 4–10 up to 15 cm. apart, bearing in robust specimens 8–10 spikelets on each side, but sometimes only 2–3; the upper inflorescences often reduced to a single spikelet; primary and secondary spathes as in the male spadix; spikelets large, the lowest 15–25 cm. long, their axis rather thick and flexuose, with 10–15 flowers on each side; the upper shorter with fewer flowers; the uppermost usually depauperate; spathels larger than in the male spikelets, infundibuliform, produced at one side into a subulate point, this ultimately, in the fruiting stage, split and marcescent; involucrophorum laterally attached near the bottom of its own spathel, attenuate at the base or nearly pedicellate, two-keeled next to the axis, embracing the involucre; involucre cupular, rather shallow, truncate, not or hardly exceeding the involucrophorum; areola of the neuter flower very distinctly lunate with acute and very sharply defined borders. *Female flowers* broadly conical, about 6 mm. long; calyx shortly and acutely 3-toothed; corolla hardly longer than the calyx, divided into 3 ovate-acute segments; stamens with filaments highly connate at the base, broadly triangular and subulate at the apex in the free portion. *Neuter flowers* relatively large, similar to the male, but more slender, 6–7 mm. long, with calyx very deeply trilobate. *Fruiting perianth* explanate, the calyx irregularly split, somewhat thickened and suberous at the base. *Fruit* regularly ellipsoid, 28–37 mm. long, 20–22 mm. in diam.; rounded and hardly caudiculate at the base, abruptly and shortly beaked-mammillate at the apex, apparently not crowned by the stigmas, these being very small and connivent; scales in 12 longitudinal series, trapezoid, broader than long (8–10 mm. wide) deeply and broadly channelled along the middle, rather shining, yellowish-reddish or chestnut-brown, darker towards the apex, with a very dark or nearly black intramarginal line, and with a narrowly scarious, pale and erosely-toothed margin. *Seed* oblong or elongate-ovoid, 25–27 mm. long by 15 mm. wide in the largest fruits, rounded to both ends, but somewhat broader at the base, nearly circular in section, not costate or furrowed outside, but only rather minutely pitted and tubercled when divested of the thin dry, once fleshy integument; chalazal fovea superficial and indistinct; albumen ruminate, penetrated by numerous very narrow channels (1–4 mm. deep) which are filled with a brown resinous material; embryo lateral near the base, obliquely penetrating nearly one-third of the albumen.

HABITAT.—The plant originally described by Roxburgh as *C. erectus* was a native of Sylhet, and it seems very common on the not very distant Khasia Hills (*Griffith*, *Hooker f.* & *Thomson* in Herb. Kew, and *G. Mann* in Herb Becc.); from these hills I have also received good specimens collected by *C. B. Clarke* at Lakkat (80 m.), at Monsto (760 m.), at Mahadeo (900 m.); in Upper Assam (*C. collinus* Griff.) near Koreahparah, one of the Bhutan Duars; in Manipur at Kassome at an elevation of 900 m. (*Watt* Nos. 5122, 5135 in Herb. Kew). Kurz writes (*Journ. As. Soc. Beng.* xliii. pt. 2, 1874, p. 210) that this species is found in Pegu, but as this author has confused *C. erectus* with *C. longisetus*, this locality very probably belongs to the last mentioned species. A *Calamus* (in Herb. Kew) gathered by Hooker f. & Thomson at Seetakoond in Chittagong, near the seashore, does not seem to me to differ from the most typical specimens of *C. erectus* from the hills.

Roxburgh says that in Sylhet "sun-gutta" is the vernacular name of this plant, and that the poorer natives use the seed as a substitute for that of *Areca.*

OBSERVATIONS.—The characteristics assigned by Roxburgh to his *C. erectus* are not many, but they are sufficient for a sure identification. I have based my description of this species mainly on the specimens collected by Mr. C. B. Clarke and by Mr. G. Mann in the Khasia Hills.

Kurz (*Journ. As. Soc.* l. c.) refers *C. longisetus* Griff. to *C. erectus*, from which, however, it is perfectly distinct (see observations under *C. longisetus*). The same author refers also *C. macrocarpus* Griff. to *C. erectus*, and in this he is certainly correct. Griffith had based the description of *C. macrocarpus* on a fruiting specimen gathered by Major Jenkins near Koreahparah, one of the Duars of Bhutan. The figure of *C. macrocarpus* in Griffith's large work (fig. I, plate 186 A) evidently represents the summit of a spadix clawed in the attenuated portions of its main axis, but this may be also very frequently observed in the most typical specimens of *C. erectus.* The very peculiar lacerate marcescent spathes of *C. erectus* are fairly represented in Griffith's quoted figure of *C. macrocarpus.* The fruits of this species in fig. I of the said plate are 4 cm. in length by 25–27 mm. in diam. and look as if they were perfectly ripe. In this stage the fruits of many species of *Calamus* increase considerably in volume by the pressure of the fleshy and watery tissues of the interior which stretch the scaly coating. Some of the fruits of *C. erectus* in the specimens gathered by Hooker f. & Thomson at Seetakoond are hardly smaller than those of *C. macrocarpus* as figured by Griffith, while they exactly agree in size and shape with those of *C. macrocarpus* as figured by Martius (l. c.). The fig. II of plate 186 A of Griffith's work represents another fruit of *C. macrocarpus* which in no way differs from those of the most typical specimens of *C. erectus.* From all these considerations I cannot consider *C. macrocarpus* even as a variety of *C. erectus.*

Griffith founded his *C. collinus* on a fruiting spadix of *C. erectus* and some portions of a leaf of a *Zalacca*, very probably of *Z. secunda*, as I have been able to ascertain from Griffith's authentic specimen in the Herbarium at Kew, where the portion of leaf preserved seems to be the very one represented in plate 186 of Griffith's work. Griffith had acknowledged the affinities between *C. collinus* and *C. schizospathus* (and hence with *C. erectus*), and to this he alludes when at the foot of the description of *C. collinus* he says: "This species appears to be closely allied to the succeeding," that is to say, to *C. schizospathus*, not to *C. macrocarpus*, as the latter has been added by the publisher of Griffith's posthumous work, the name '*macrocarpus*' not being mentioned in the original paper on Palms published in the Calcutta Journal; moreover, Griffith not having seen the leaves of his *C. macrocarpus* could not have added to the description of this species "the terminal part of the leaf of which (viz. *C. schizospathus*) differs however from this species (viz. *C. collinus*), etc." The fruit of the authentic specimen of *C. collinus* is of the same shape as that of the true *C. erectus*, but a little smaller, being 3 cm. by 18 mm. The seed of this fruit is not quite ripe and is only a little smaller than, but is otherwise perfectly like that of *C. erectus*. The spadix looks more compact and shorter than is usual in the specimens of *C. erectus* I have examined, and is not aculeate on its axial portions and the partial inflorescences are formed by single spikelets; but probably what was considered by Griffith to be an entire spadix is only a branch or partial inflorescence; besides, the spadix in the figure of *C.*

collinus mentioned is terminated by a short appendix clothed with diminutive spathes; but the termination of the spadix of *C. erectus* seems very variable.

Amongst the numerous and complete specimens of *C. erectus* which have been sent to me by Mr. G. Mann from the Khasia Hills, there is an entire male spadix without any flagelliform appendix at its summit and with flowers more slender than usual; on the other hand another spadix is terminated by a flagelliform appendix 35 cm. long. Some of the female spadices have many partial inflorescences, of which the largest, the lowest, bears on each side 8–10 spikelets; other spadices have 4–5 partial inflorescences only, and of these the lowest are composed of 3–4 spikelets, and the uppermost of one. From the foregoing considerations, I feel inclined to consider *C. collinus* also as not even a variety of *C. erectus.*

A large specimen of *C. erectus* received from Dr. Treub and taken from a plant cultivated at Buitenzorg has a leaf 4 m. in length, including the petiole, which is 80 cm. long, three-fourths-terete, 2 cm. in diam., narrowly channelled above, armed, in the lower portion of the rachis, with nearly complete, rather remote (5–10 cm. apart) horizontal or slightly oblique pectinate whorls of flat pale spines, 2–3 cm. long and confluent at their bases. The largest leaflets are 75 cm. long. The spadix is nearly 3 m. long inclusive of a flattened peduncular portion 1 m. in length, and a terminal rudimentary slightly aculeate flagellum 50 cm. long.

A very remarkable character in *C. erectus* is furnished by the two large and prickly auricles formed by the division of the ocrea at the mouth of the leaf-sheaths; but as that organ is deciduous, they are wanting in old leaves.

PLATE 1.—Calamus erectus *Roxb.* The figure on the right side above is taken from a specimen collected by G. Mann in the Khasia Hills, and represents the upper portion of a leaf-sheath with the peculiar auricles of the ocrea and the basal portion of a male spadix; from the same place and collector are the two fruits and the seed near the left corner. The figure in the middle represents a portion of a male spadix from Lakkat (C. B. Clarke). The figure on the left side is the lower portion of a leaf from the Khasia Hills (G. Mann). The figure on the left upper corner is a spikelet with ripe fruits and seeds from Monsto (C. B. Clarke). The fruits in the middle are also from the Khasia Hills (C. B. Clarke). The fruits in the lower right-hand corner accompanied by an entire seed, one longitudinally cut through the embryo and another in transverse section, are from Monsto (C. B. Clarke).

CALAMUS ERECTUS Roxb. *var.* SCHIZOSPATHUS Becc.

C. schizospathus Griff. in Calc. Journ. v, 32 and Palms Brit. Ind. 41, pl. clxxxvii; Mart. Hist. Nat. Palm. iii, 332; Walp. Ann. iii, 482 and v, 829; T. Anders. in Journ. Linn. Soc. xi (1869), 71; Gamble Man. Ind. Timb. 423; Becc. in Rec. Bot. Surv. Ind. ii, 197.

C. erectus Becc. (partly) in Hook. f. Fl. Brit. Ind. vi, 438.

DESCRIPTION.—Leaflets more or less distinctly 3–5-costulate; the secondary nerves sometimes more conspicuous than in the type, and one of these on each side of the mid-costa furnished like it with a few bristles on the lower surface and sometimes also on the upper one mainly towards the summit. *Male spadix*, spathes and spikelets as in typical *C. erectus,* but the spathels more distinctly striately veined, the flowers more immersed in the involucres, the calyx half-projecting from the involucres and strongly veined, the corolla twice as long as the calyx. *Fruit* as in the type.

HABITAT.—India: Sikkim in Upper Camon and Lower Singbik and Rhu (*Hooker f. & Thomson* in Herb. Kew); at Currssiong (Kurseong), 1,400 m. elev. (*T. Anderson* in Herb. Boiss.); Sivoke on the Teesta, 1,000 m. elev. (*Brandis* in Herb. Becc.); hills near Sivoke.

Gamble (l. c.) writes that this has a stem about 5 cm. in diam. with hard wood and closely packed fibrovascular bundles, very close, as usual, towards the edge; the canes, however, are useless (Gamble Mss.). It is called "Rong" and "Reem" by the Lepchas, but it is known also in Sikkim by the name of "Phekri Bet," but probably these names are also applied to the typical form.

OBSERVATIONS.—I had considered *C. schizospathus* quite the same as *C. erectus* (Becc. in Hook. f. Fl. Brit. Ind. l. c.) following Hooker and Thomson who on the labels of the distributed specimens of the Herb. Ind. Orient., had already united the two species. Nevertheless T. Anderson (*Journ. Linn. Soc.* xi, p. 8) considers *C. schizospathus* as a species distinct from *C. erectus*, and writes as follows: "*C. erectus* of Roxburgh from Silhet and perhaps from Chittagong is a nearly allied species; but its ripe fruits are nearly half as large again as those of *C. schizospathus*," which is found on the steep northern slopes of the valleys of the rivers Teesta and Rungeet, where micaceous slate abounds.

A good specimen of *C. erectus schizospathus* from Sikkim sent to me in September 1902 by Lieut.-Col. Prain has ripe fruits 32 mm. long and 20 mm. in diam., and consequently not smaller than those of the type with which they perfectly agree also in shape and all other characteristics. In the leaflets of this specimen I have not been able to find any difference from those of the typical *C. erectus* from Khasia; the sheathed stem 7 cm. in diam. and the naked canes 4·5 cm. In the male specimens from Sikkim I had at my disposal, the spikelets are larger than in the specimens coming from Khasia and Sylhet, and have more broadly infundibuliform and more distinctly striate spathels, the flowers are more deeply enclosed in the involucres, more ovoid or less elongate, and with the corolla relatively shorter and the calyx more distinctly striate. I consider *C. erectus schizospathus* to be only a local form of *C. erectus*, peculiar to the hot and damp sub-Himalayan region in Sikkim and Darjeeling, while the type abounds more to the east, mainly in Assam, Sylhet, Khasia, Manipur, etc.

PLATE 2.—Calamus erectus *Roxb.* VAR. schizospathus *Becc.* Portions of a leaf from an adult plant, and partial inflorescence of the lower part of a male spadix, from a specimen collected by Dr. Brandis at Sivoke (1000 m.) on the Teesta.

CALAMUS ERECTUS Roxb. *var.* BIRMANICUS Becc. in Rec. Bot. Surv. Ind. ii, 197.

DESCRIPTION.—Female spadix more slender than in the type and produced into a rather long (75 cm.) flagelliform aculeate appendix; also the fruit smaller (20–30 mm. by 14–16 mm.).

HABITAT.—Burma: on the Karen mountains at an elevation of 1000–1200 m., collected by Sig. L. Fea in Dec. 1887.

Plate 3.—Calamus erectus *Roxb.* var. birmanicus *Becc.* Portion of a leaf and upper part of a spadix in fruit. From Sig. Fea's specimen.

2. Calamus Flagellum Griff. in Mart. Hist. Nat. Palm. iii, 333, pl. 176, f. ix; Griff. Palms Brit. Ind. p. 48; Walp. Ann. iii, 484 and v, 830; T. And. in Journ. Linn. Soc. xi (1869), 8; Gamble Man. Ind. Timb. 423; Hook. f. Fl. Brit. Ind. vi, 439; Becc. in Rec. Bot. Surv. Ind. ii, 197.

C. Jenkinsianus Griff. Palms Brit. Ind. 40, pl. clxxxvi A. fig. iii (not p. 89).

C. polygamus Roxb. Fl. Ind. iii, 780?

Description.—Scandent, robust and large. *Sheathed stem* 4–5 cm. in diam.; naked canes 2·5–3 cm. in diam. *Leaf-sheaths* gibbous above, flagelliferous, densely armed with scattered or sometimes confluent, spreading or somewhat deflexed, laminar, extremely acuminate spines, which are usually 3–4 cm. long (those near the mouth even 6–7 cm.) and intermingled with innumerable others of all sizes also scattered. *Ocrea* membranous, dry, exsuccous, extending at the sides of the petiole into two small unarmed rounded auricles ultimately marcescent and deciduous. *Leaf-sheath flagella* very long (sometimes 7 m.) closely armed with half-three-fourths whorls of dark-tipped claws. *Leaves* very large not cirriferous, petiole very stout, 2–3 cm. thick, 30–45 cm. long, broadly channelled above, rounded beneath, where irregularly armed, mainly at the sides and more sparingly along the middle, with variable straight spines; rachis in its first portion flattish or slightly concave above with the side angles acute and spinulous and with broad side-faces where are inserted the leaflets; upwards acutely angular and with two side faces above and armed beneath up to the summit with a central series of solitary claws; leaflets numerous, equidistant or very nearly so (4–7 cm. apart), alternate or sub-opposite, rather firm, green, almost shining on both surfaces, slightly paler beneath, broadly ensiform, alternate and deeply plicate at the base, gradually acuminate at the apex; the mid-costa stout, furnished on both surfaces, but mainly above, with few subspiny bristles; secondary nerves sometimes rather strong, naked on both faces; transverse veinlets approximate and distinct; margins ciliate with short spiny bristles which are rather remote lower down and approximate at the summit; the largest leaflets 60–70 cm. long and 3·5–4 cm. broad; the upper ones shorter; the two of the terminal pair the smallest and confluent at the base. *Male spadix* excessively long (4–5 m. and more), flagelliform, simply decompound or slightly and partially supradecompound, prolonged at the apex into a long, strongly clawed flagellum and armed on the back on the very long unsheathed portions between two partial inflorescences with half-whorls of very stout claws; primary spathes tubular, very closely sheathing, very long, coriaceous, longitudinally split, lacerated and fibrous at the summit; the lowest somewhat compressed and acutely two-edged, more or less armed with claws on the back and with straight auricles at the edges; upper primary spathes cylindraceous, strongly clawed on the back; partial inflorescences very few, very remote (even 1 m. apart), nodding, with 3–4 spikelets on each side; secondary spathes unarmed, tubular, narrowly infundibuliform, obliquely truncate at the mouth and extended at one side into a triangular, speedily withered and lacerated tip; spikelets 10–25 cm. long, flexuose, slightly compressed, bearing 18–30 distichous and rather remote flowers on each side; spathels fugaciously scaly furfuraceous, broadly asymmetrically infundibuliform with truncate and discoloured subscarious margin, more or less produced at one side into a split and lacerated tip; involucre cupular, truncate, shorter than its own spathel and laterally adnate at the base of the one above. *Male flowers* elongate, acute, 8–11 mm. long, 3 mm. broad, outwardly curved, half-projecting from the spathel; calyx divided down almost to the middle into 3 lobes; corolla not quite twice as long as the calyx, almost entirely divided into 3 lanceolate, acute segments; stamens with subulate filaments not inflected at the apex and united at the base with the corolla; anthers large, broadly linear, attached to the middle; rudiment of the pistil formed of 3 small acicular bodies. *Female spadix* very nearly the same as the male; partial inflorescences very few (5–6 at most); spikelets very remote, elongate (20–35 cm. long), subcylindrical, vermicular, curved downwards, inserted near the mouth of their respective spathes; spathels infundibuliform, rather elongate with the margin truncate and withered, produced on one side into a triangular and lacerated point; involucrophorum unilaterally cupular, truncate, nearly exserted from its own spathel and attached at the base of the one above; involucre cupular, truncate, almost entirely immersed in the involucrophorum; areola of the neuter flower distinctly lunate. *Female flowers* conical-ovoid acute, relatively large (about 7 mm. long); calyx ovate, very shortly 3-dentate; petals lanceolate, acute, a little longer than the calyx; stamens with triangular, subulate filaments highly connate at the base; anthers sagittate, blunt; ovary ovate, crowned by the trigonous stigmas. *Neuter flowers* narrower than the female ones, but nearly as long, soon deciduous. *Fruiting perianth* explanate (not pedicelliform); its calyx completely split; its corolla marcescent. *Fruit* large, when perfectly ripe about 3 cm. long by 20–22 mm. in width, broadly ovoid, rounded at the base, abruptly and shortly beaked; scales very large, in 12 longitudinal series, channelled along the middle, of a dirty straw colour with a dark intramarginal line, lighter finely erose margins and obtuse apex. *Seed* regularly ovoid, rounded at the base, slightly narrowing towards the obtuse apex, circular in section, 20–22 mm. long and 13–15 mm. in diam., covered with a dry (at first fleshy) adherent coat, and minutely pitted on the surface beneath the coat; chalazal fovea very superficial and indistinct; albumen deeply ruminate; embryo 3–4 mm. long, basilar.

HABITAT.—N. E. India. The type specimens, which I have seen in the Herbarium at Kew, were gathered by Major Jenkins at Golaghat on the River Dhunseeri in Assam. It grows also on the Khasia Hills at Churra (*Hooker f. & Thomson* in Herb. Kew), in Cachar in the Daarbund pass and at Shapore (*Keenan* in Herb. Kew); in Eastern Bengal on the Soorma (*Hooker f. & Thomson* in Herb. Kew); in Sikkim, where according to Anderson it is by far the commonest *Calamus*, from the level of the plains as high as Kurseong (1370 m.); amongst the *Podocarpus* (*Hooker f. & Thomson* in Herb. Kew); Dulka-Jahr (*Gamble*).

The canes, though very long (this Palm reaching to the top of the highest trees), are soft and useless (Anderson). It receives the vernacular names (according to Gamble) of "Rabi Beṭ" by the Nepalese, of "Reem" by the Lepchas, and of "Nagagola Beṭ" in Assam. The fruit is edible (*Hooker f.*).

OBSERVATIONS.—Griffith has given a long and accurate description of the male plant of this species of which I have examined the original specimens in the Herbarium at Kew.

The fruit represented in fig. III of plate CLXXXVI A in the work of Griffith with the name of *C. Jenkinsianus* is that of *C. Flagellum*, as may be proved by the fig. IX, plate 176, of Martius Hist. Nat. Palm. where the same fruit bears its true name.

C. Flagellum is very closely allied to *C. erectus* by the structure of the flowers and seeds, but it is easily distinguished by the scandent stem, the flagelliferous leaf-sheaths and very elongate flagelliferous spadices (which are strongly armed in the unsheathed axial portions with half-whorls of stout claws) and the partial very remote inflorescences. Furthermore, the leaf-rachis is not armed on the back with straight long spines, but is clawed throughout to the extreme apex. The seed is very similar to that of *C. erectus* in size, shape and rumination. *C. Flagellum* may be considered to be *C. erectus* transformed into a climbing plant.

A very large specimen from a plant cultivated in the Botanic Garden at Buitenzorg has the sheathed stem 5 cm. in diam.; the petioles 2 cm. thick; the leaf-sheaths, petiole, rachis and spadix covered with a grey fuscescent fugacious scurf. An entire leaf is 2 m. long, the largest leaflets measure 60 cm. by 4 cm. The male spadix is simply decompound or in large specimens furnished with some additional spikelets in the lower partial inflorescences. One spadix I measured was 3·5 m. in length and terminated by a very formidably armed flagellum which was as long; partial inflorescences very few (only 2–3), 40–70 cm. apart with few (3–6) spikelets on each side and ending in a spikelet longer than the side ones, which are 10–20 cm. long. Of the female plant I have received from Lieut.-Col. Prain an entire upper portion collected in Sikkim and bearing very unripe fruits, which are 3 cm. long, narrowing into a conical beak with small connivent stigmas.

Plate 4.—Calamus Flagellum *Griff.* Portion of the upper part of a leaf seen from the lower surface, and terminal part of a male spadix from the already-mentioned plant cultivated at Buitenzorg.

Plate 5.—Calamus Flagellum *Griff.* Basal portion of a leaf from the cultivated male plant mentioned above; basal portion of a female spadix in flower with an entire partial inflorescence from Assam (Herb. de Cand.); spikelet with immature fruit from Sikkim (Herb. Becc.).

Calamus Flagellum Griff. *var.* karinensis Becc.

Description.—Large and scandent. *Sheathed stem* 5 cm. in diam. *Leaf-sheaths* flagelliferous, slightly puckered above, densely armed with dark, very acuminate, laminar spines which are light at the base, darkening towards the apex, 4–6 cm. long, usually deflexed, solitary or confluent and forming interrupted series, and intermingled with innumerable criniform prickles disposed in crowded transversely irregular series. *Ocrea* in full-grown leaves inconspicuous. *Leaves* large, not cirriferous (only one seen and perhaps not of the upper part of an adult plant), about 2·5 m. long; petiole very stout, 2–3 cm. thick, rather short (20–25 cm. long), broadly chanelled above, rounded beneath, where, as in the first portion of the rachis, it is regularly armed at the sides and along the middle with straight laminar spines; in the middle portion the rachis is flattish or slightly concave above, with the side-angles acute and spinulose and with broad side-faces, where are inserted the leaflets; upwards towards the apex the rachis is trigonous with two side-faces above and armed beneath with solitary or ternate, black, deflexed, usually straight or slightly hooked spines; leaflets numerous, equidistant, rather firm, green, almost shining on both surfaces, slightly paler beneath, broadly ensiform, alternate and deeply plicate at the base, gradually acuminate towards the apex; their midribs stout, furnished on both surfaces, but mainly above, with few subspiny black bristles; secondary nerves slender, naked on both surfaces; transverse veinlets approximate and distinct; margins ciliate with relatively strong black spinules which are more crowded towards the apex; the largest leaflets, those a little above the base, about 70 cm. long and 3–4 cm. in width, the upper shorter, the two of the terminal pair the smallest. *Male spadix* not seen. *Female spadix:* primary and secondary spathes not seen; in one specimen a partial inflorescence is about 60 cm. long with 5–6 spikelets on each side and terminates in a slender tail-like unarmed appendix which is about 10 cm. long; secondary spathes tubular, slightly enlarged above, closely sheathing, coriaceous, 3–4 cm. long, unarmed, obliquely truncate at the mouth where it is produced at one side into a triangular point and at length decays; spikelets inserted at or a little below the mouths of their respective spathes, vermicular, subcylindrical, flexuose 10–15 cm. long; spathels infundibuliform, smooth, truncate, entire or ultimately somewhat decayed at the margin, slightly produced at one side into a short point; involucrophorum unilaterally cupular, truncate, almost projecting from its own spathel and attached at the base of the one above; involucre cupular, truncate, almost entirely immersed in the involucrophorum; areola of the neuter flower distinctly lunate. *Fruit* large, when perfectly ripe 30 mm. long, 22–24 mm. broad, broadly ovoid, equally rounded at both ends, very suddenly apiculate at the apex with the vestiges of the very small and connivent stigmas; scales very large, very gibbous and deeply channelled along the middle, of a dirty yellowish or straw colour with narrow scarious and finely erose margin and obtuse apex. *Seed* regularly ovoid, rounded at both ends, 2 cm. long, 15 mm. in diam., circular in transverse section, enveloped in a dry (at first fleshy) adherent coat and when freed from this minutely pitted on the surface; albumen rather deeply ruminate; embryo perfectly basilar or sometimes slightly to one side.

HABITAT.—Collected by *Sig. Leonardo Fea* in January 1888 in the Valley of Yado in Burma at an elevation of 1200–1400 m.

OBSERVATIONS.—This variety differs from the type in the leaf-sheaths covered with distinctly seriate spines; in the inflorescences with more numerous and shorter spikelets; in the spathes and spathels less lacerated at the margin and in the fruit scales not bordered with a dark line and more deeply furrowed along the middle. The leaf-rachis armed on the back not with a series of solitary claws, but with deflexed, black, flat, often binate or ternate spines, is a peculiarity probably depending on the leaf not being collected from the upper part of the adult plant. If this were a constant character this variety ought to be raised to specific rank.

PLATE 6.—Calamus Fagellum *Griff.* VAR. karinensis *Becc.* Portion of a sheathed stem; portion of a leaf (under surface) near the apex; partial inflorescence with mature fruit; seed, entire, longitudinally cut through the embryo and in transverse section. From Sig. Fea's specimen in Herb. Becc.

3. CALAMUS ARBORESCENS Griff. in Calc. Journ. v, 33, and Palms Brit. Ind. 42, t. clxxxviii A. B. C.; Mart. Hist. Nat. Palm. iii, 332; Walp. Ann. iii, 483, and v, 829; Miq. Fl. Ind. Bat. iii, 113; Teysm. Cat. Hort. Bot. Bog. 74; Kurz in Journ. As. Soc. Beng. xliii, pt. 2, 208, t. xxii, and For. Fl. Brit. Burma ii, 516, and Rep. Veg. Pegu (1875), 90; Gamble, Man. Ind. Timb. 423; Hook. f. Fl. Brit. Ind. vi, 439, Becc. in Rec. Bot. Surv. of Ind. ii, 198.

C. hostilis Hort. Calc.

DESCRIPTION.—Not scandent, cæspitose. *Stem* erect, 4–6 m. high, 6·5 cm. in diam. (Griffith); with annular green internodes about 18 cm. long (Griffith). *Leaf-sheaths* short, not tubular, open on the ventral side, not flagelliferous. *Leaves* very large (as long as 5 m.) not cirriferous, forming a crown at the apex of the trunk; peticle very long (·6–1·5 m.) and very stout, deeply channelled above, rounded beneath and powerfully armed with very large, thinly laminar, elastic, black, polished and very acuminate spines, of which the largest are 7–8 cm. long and 6–8 mm. in width at the undilated base, intermingled with smaller ones, which are disposed in oblique and often nearly complete series; rachis covered when young with whitish scurf, then glabrous, armed beneath with laminar, confluent, long straight, deflexed spines, which are in every respect similar to those of the petiole and are verticillate and pectinate in the lower portion, becoming upwards ternate or binate and at last solitary towards the apex but always straight and very long; above, the rachis is trigonous with two-side faces above from the middle upwards and smooth; leaflets numerous, equidistant, alternate or subopposite, rather distant, very narrowly lanceolate or broadly ensiform, very long (up to 1 m.) and 3–5·5 cm. in width, narrowed and deeply plicate at the base, gradually acuminate into an acute apex which is bristly-spinulous at the sides, conspicuously two-coloured, green and shining on the upper surface, and white and dull beneath, with the mid-rib stout and bristly mainly towards the apex on both faces; lateral nerves rather slender, one on each side of the mid-rib sometimes sparingly spinulous beneath; transverse veinlets sharp and crowded above, indistinct beneath; margins very bristly and pungent. *Male spadix* very long (1·5 m., Griffith), pendulous, not flagelliferous at its apex, supradecompound, with many approximate partial inflorescences; primary spathes not very long (20–30 cm.), tubular, rather closely sheathing, thinly coriaceous, lacerated and fibrous in their upper part; armed with very slender, black, needle-like, scattered or subseriate spines; the lowest spathe somewhat compressed, the upper cylindraceous, slightly enlarged above; partial inflorescences very long (60–90 cm.), the lower decompound, the upper simple, with rather numerous spikelets on each side; secondary spathes tubular at the base with a clavate or subinflated split and lacerated limb, which is often blackened, withered and usually armed with scattered, spreading, subulate, black spines; spikelets not pedicellate, inserted near the mouth of their respective spathes, large, 10–15 cm. long, flattened, with 20–30 perfectly bifarious and regularly pectinate flowers; spathels very closely imbricated, short, broadly infundibuliform, horizontally truncate and produced at one side into a very short triangular point, which is usually split; involucre hidden in its own spathe and inserted at the base of the one above, dimidiately cupular or like a swallow's nest, obliquely truncate, flat, two-keeled, emarginate and bidentate on the side next to the axis. *Male flowers* inserted at an angle of 45°, elongate, large, 10 mm. long and 2·5–3 mm. thick, often slightly outwardly curved; calyx ovate, divided down to about the middle into 3 semi-ovate acute lobes, not striate; corolla two and a half to three times as long as the calyx, divided into 3 broadly linear, or narrowly lanceolate acute segments, entire where it is enclosed in the calyx; stamens united to the corolla in its undivided basal portion; filaments linear, subulate, inflected at the apex in the bud; anthers broadly linear attached by the middle, versatile, their cells parallel, shortly discrete at the base; rudimentary pistil long, consisting of three angular, elongated, acute bodies united to the middle. *Female spadix* with partial inflorescences 40 cm. long (at least the one seen, which perhaps is not entire), with 5 spikelets on each side; secondary spathes as in the male spadix, unarmed, tubular, enlarged and somewhat inflated above, withered and lacerated upwards and transversely zoned; spikelets flexuose, spreading or recurved, 15–18 cm. long with 18–20 distichous flowers on each side; spathels infundibuliform, truncate, produced on one side into a short ultimately decayed point; involucrophorum obliquely cupular, nearly entirely included in its own spathel at the base of the one above, flat, 2-keeled and 2-toothed on the side next to the axis; involucre hardly longer than the involucrophorum, cupular, truncate, entire or superficially 3-toothed; areola of the neuter flower depressed-lunate, sharply defined. *Female flowers* about 7 mm. long. *Fruiting perianth* explanate, the calyx split into 3 broadly ovate acute parts, not or hardly callous at the base; the corolla with the segments narrower but a little longer than the lobes of the calyx; the stamens with filaments united as usual by their bases, triangular in the free portion and a little shorter than the calyx. *Fruit* 20–22 mm. long, 14–15 mm. broad, obovoid oblong, suddenly and stoutly beaked; scales in 12 longitudinal series, rather broader than long, deeply channelled along the middle, dirty yellowish or reddish-brown, with a very narrow, darker intramarginal line and finely ciliately fringed margins, especially near the rather obtuse tip. *Seed*, when freed from the integument, 12 mm. long, 6 mm. thick, with a very uneven, almost facetted surface on the raphal side and with a deep central chalazal fovea; albumen bony, equable; embryo exactly basilar.

HABITAT.—Burma: in marshy places in Pegu. At Bassein, Myaungmya Division at Kyetsha, Walkema Subdivision and at Rangoon (*I. H. Burkill*). Kurz writes that it is "frequent in marshy beds of choungs, in the moister and evergreen tropical forests of Pegu, on the sandstone," and that it is called "Thanoung" by the Burmans. Gamble (l. c.) gives the Burmese names of "Danoung" and "Kyenbankyen" and Burkill those of "Damon" and "Danoung Thain."

OBSERVATIONS.—Griffith who had described this species diffusedly from male plants cultivated in the Botanic Garden at Calcutta, says that it is "a very elegant palm, in some cases stoloniferous, forming at the base, apparently from offsets, very thick leafy tufts, from which arise elegant stems fifteen or twenty feet high, two and a half inches in diameter" and that it is "a very handsome and well-marked species distinguished by its erect stems, dark brown almost black spines and the leaves which are white underneath," and I may add by the want of claws or short hooked spines on the spadix and on the leaf-rachis, where only black straight flat or needle-like spines are to be found. Very few *Calami* have the leaflets so decidely white underneath as this.

A very large and complete specimen from a plant cultivated at Buitenzorg and sent to me by Dr. Treub has a leaf 5 m. long, including the petiole, which is 1·5 m. in length and is as thick as a man's wrist; the largest leaflets are more than 1 m. long; the male spadix measures 5 m. and terminates in a rather long tail-like, aculeate (not clawed) appendix. The partial inflorescences are very large and the lower ones decompound.

PLATE 7.—Calamus arborescens *Griff.* Portion of a leaf and apex of a male partial inflorescence. From the above mentioned plant cultivated at Buitenzorg.

4. CALAMUS DONGNAIENSIS Pierre Mss. ex Becc. in Rec. Bot. Surv. Ind. ii, 198.

DESCRIPTION.—Tufted and nearly stemless, 1–3 m. high (Pierre). *Leaves* very large, not cirriferous; petiole (the one seen, probably from a radical leaf) nearly terete or very obscurely trigonous, sparsely armed with straight, rather short and slightly deflexed spines, which are seated on a broad base; rachis (of the upper portion of the leaf) trigonous, bifaced above, flattish beneath, where marked with deep impressions left by the pressure of the spines during prefoliation, and where it is rather densely armed with long (4–5 cm.), flat, elastic, black-tipped spines, which are paler and yellowish at the base; leaflets inequidistant, ensiform, very gradually acuminate, green and subshining on both surfaces with their mid-rib furnished above near the apex with few distant spinules and beneath, especially from the middle upwards, with some stiff spadiceous bristles (10–15 mm. long); secondary nerves slender, only one on each side of the mid-rib furnished with a few spinules on the upper surface and occasionally also on the lower one; transverse veinlets very many, rather distinct and interrupted; the largest leaflets seen are 50–60 cm. long, 2·5–3 cm. broad; the upper shorter; the two of the terminal pair the smallest and united at the base. *Male spadix* simply decompound, very long, the one seen 2·5 m. long, thinly covered with a very easily removable dark scurf and prolonged into a long, caudate, sterile, sheathed not clawed appendix, but armed with needle-like, black, straight and slender spines or totally unarmed; the peduncular portion of the spadix is rather long, flattened and unarmed throughout; lowest primary spathe elongate, flattened and two-edged, unarmed; the upper spathes tubular, cylindraceous at the base, enlarged above into a somewhat inflated, lanceolate, much lacerated or longitudinally split and withered limb, which is of a greenish-straw colour and is covered with a thin, deciduous, brown scurf and is more or less distinctly marked with few transverse zones or slightly raised ridges; the attenuated and lower portion of the spathes is armed with straight, flat, subulate, unequal spines, of which some are 2 cm. long and arise solitary or fascicled from a pale tubercle; partial inflorescences 5–6, the lowest, the largest, about 40 cm. long, with few (4) remote spikelets on each side; secondary spathes elongate-infundibuliform with an inflated sub-auricled limb, which is speedily withered and lacerated, zoned as in the primary ones; spikelets not pedicellate, inserted near the mouth of their respective spathes, large, 10–15 cm. long, with up to 20 flowers on each side, flexuose, flattened, scaly-furfuraceous; spathels short, broadly and asymmetrically infundibuliform, truncate, entire, not ciliate at the margin, extended on one side into a very short point; involucre half-exserted from its own spathel and laterally attached to the base of the one above, two-keeled and deeply emarginate on the side next to the axis, otherwise entire and obliquely truncate. *Male flowers* perfectly bifarious, very regularly alternate and 5–6 mm. apart, obtusely trigonous, 8–10 mm. long, 3 mm. thick, occasionally slightly curved, narrowly oblong, gradually attenuated from the middle upwards into an almost acute point; calyx striately nervose, subcampanulate, divided down about to the middle into 3 large triangular almost acute lobes; corolla twice as long as the calyx or nearly so, divided down nearly to the base into 3 elliptic-lanceolate segments; stamens with filaments complanate in their lower part, subulate upward, not inflected at the apex; anthers narrowly subsagittate, with cells deeply discrete at the base; rudimentary ovary columnar, a little shorter than the filaments, divided into three subulate bodies. Other parts unknown.

HABITAT.—Discovered by M. L. Pierre in March 1877 in the northern part of the River Dongnai at Chiao-xhan in Lower Cochin-China (Herb. Pierre No. 4829). The fruit is eaten by the natives (Pierre).

OBSERVATIONS.—I have seen only a male spadix and some portions of leaves of this very fine species which is closely related to *C. arborescens* Griff., from which it differs in the leaflets being of the same green colour on both surfaces and not white underneath, and in the limb of the secondary spathes being greenish and when withered and decayed not nearly black. The spikelets and the flowers are very much the same as those of *C. erectus*, but from this *C. dongnaiensis* differs in its inflated spathes. *C. longisetus* is also another allied species, but this is climbing and is powerfully clawed in the attenuated axial portions of the spadix, while *C. dongnaiensis* bears only straight spines throughout.

PLATE 8.—Calamus dongnaiensis *Pierre*. Apex of a leaf and leaflets of an intermediate portion of leaf; basal portion of a male spadix with an entire partial inflorescence and the terminal portion of the same spadix. From the authentic specimen of Pierre in Herb. Becc.

5. CALAMUS LONGISETUS Griff. in Calc. Journ. Nat. Hist. v, 36, and Palms Brit. Ind. 44, t. clxxxix. A.B.; Mart. Hist. Nat. Palm. iii, 333; Walp. Ann. iii, 483, and v, 830; Miq. Fl. Ind. Bat. iii, 114; Hook. f. Fl. Brit. Ind. vi, 440; Becc. in Rec. Bot. Surv. Ind. ii, 199.

C. tigrinus Kurz in Journ. As. Soc. Bengal, xliii, pt. 2 (1874), 211, t. xxv and xxvi and For. Fl. Brit. Burma ii, 519.

DESCRIPTION.—Large and scandent; *unsheathed stem* 2·5–3 cm. in diam. *Leaf-sheaths* (probably flagelliferous) fearfully armed with whorls and half-whorls of broad, flat, sharp, glossy, fuscous or black spines (about 3 cm. long), intermingled with shorter or thinner ones (Kurz). *Leaves* very large (3–4 m., Griffith), not cirriferous; petiole long, 2–2·5 cm. thick, deeply channelled above, round and armed beneath with spines similar to those of the sheaths and of various sizes (some of them 4 cm. long) scattered or variously aggregated in more or less complete comb-like whorls; rachis of the middle and anterior portion subtrigonous, bifaced and not very acute above, rounded and armed along the middle below with solitary, strong, short, black, deflexed spines; leaflets inequidistant or approximate in not distant groups of 2–3 in the lower portion of the rachis, subequidistant towards the summit, green and shining on both surfaces, faintly paler beneath, ensiform, subulately acuminate; mid-costa acute and remotely spinulous towards the apex above, furnished below with some very long (sometimes even 3 cm.) blackish bristles; secondary nerves not strong but distinct, of these one on each side of the mid-costa occasionally bristly above, all naked beneath; margins ciliate, mainly near the apex, with short, black, somewhat approximate, spiny bristles; transverse veinlets fine, very distinct and much interrupted; the largest leaflets 60–65 cm. long, 3–4 cm. broad, the two of the apical pair shorter than the others and confluent at the base. *Male spadix* very long, flagelliferous, simply decompound, with few, elongate, (40–60 cm. long), partial inflorescences ending in a short, flattened, unarmed, caudiform appendix and bearing 5–6 distichous, remote, erect spikelets on each side; the elongated part of the axis between two inflorescences and the apical, very long and stout flagellum are armed with rather approximate half-whorls of black-tipped claws with swollen and confluent bases; primary spathes elongate-tubular, rather loosely sheathing, with lacerated decayed limb, armed with short strong claws, often confluent, mainly near the base; secondary spathes unarmed, shortly tubular at the base, and with a somewhat inflated lanceolate limb, at first truncate acuminate at one side, but later decayed and lacerated in the upper portion, the basal still living portion being sharply defined from the dead one by a distinct dark transverse line; spikelets inserted inside their own spathe but not pedicellate, very large, flattened, 10-12 cm. long, and 2 cm. broad, when covered with fully developed flowers, which number 20–22 on each side and are very regularly distichously and closely set; spathels fugaciously furfuraceous, closely packed, short, asymmetrically and broadly infundibuliform, truncate, apiculate at one side and split under the flower; involucre nearly entirely enclosed in its own spathel, and laterally attached to the base of the one above, dimidiately cupular or like a swallow's nest, obliquely truncate and entire on the front side, deeply emarginate and two-toothed posticously next to the axis. *Male flowers* amongst the largest in the genus, 8–11 mm. long, 3–4 mm. thick, oblong, obtusely trigonous, sometimes slightly curved, somewhat attenuated at the apex; calyx thinly pergamentaceous, finely striately nerved, with 3 short, broad, triangular, very acute or apiculate lobes; corolla more than twice or nearly three times as long as the calyx, shortly tubular at the base, with oblong or elliptic segments; filaments of the stamens stout, not much shorter than the segments, inflected at the apex, united at the base with the undivided part of the corolla; anthers large, broadly linear, acute, the cells shortly discrete and obtuse at the base, rudimentary ovary small, formed by three very minute subulate bodies. *Female spadix* simply decompound; primary and secondary spathes as in the male spadix; spikelets flexuose, 10–16 cm. long, thicker and larger than the male ones; spathels ultimately lacerated and decayed at the apex; involucrophorum unilaterally infundibuliform, not exceeding its own spathes and attached to the base of the one above, deeply emarginate, two-toothed and acutely two-keeled posticously next to the axis; involucre cupular, nearly entirely exserted from the involucrophorum, truncate, emarginate and toothed on the side of the neuter flower, of which the areola is rather deep, lunate, but often somewhat vertically evolute, and sharply defined. *Female flowers* large, about 1 cm. long. *Fruiting perianth* explanate under the fruit and not pedicelliform, its calyx 3-toothed; its corolla with the petals lanceolate, as long as the calyx; its stamens with filaments broadly triangular, suddenly subulate and not very highly connate at the base. *Fruit* elliptic-ovate, when fully developed 30–33 mm. long and 15–20 mm. in diam., tapering at both ends, but more towards the apex, which is regularly conical and acuminate; scales in 12 longitudinal series, slightly convex, not channelled along the middle, longer than broad, yellowish in the unexposed part, marked across the centre with a conspicuous, lunate, blackish, shining band (giving the fruit the appearance of being mottled like a tiger-skin), and prolonged into a triangular, pale, scarious apex, which is conspicuously fringed at the margin. *Seed* oblong, 18 mm. long, 11 mm. broad and a little less in thickness, flat at the base, longitudinally 5–7-costate and superficially channelled on the back, smooth on the raphal side, where marked with a narrow circular chalazal fovea penetrating nearly to the centre; albumen equable; embryo in the middle of the base.

HABITAT.—Pegu (*Griffith*), Rangoon (*McClelland* in Herb. Kew, *Burkill*); Hill jungle at Port Mouat ravine, Kada Kachan, and Ali Masjid in South Andaman (*Sir G. King's collector* in Herb. Calc.). Vern. name "Leme" (Burkill).

Kurz writes that this is common in the evergreen tropical forests from the eastern slopes of the Pegu Yomah and Martaban down to Tenasserim and the Andamans, and that it is called "Lémé" in Burma and "Umdah" by the Andamanese. From the Andamans I have received some very good specimens through Mr. E. H. Man, who says that the natives eat the fruit cooked, and employ the leaflets for coverings, and that they give it the name of "Am." The samples of the canes, which also seem to be employed by the Andamanese, have a polished yellow surface and are from 2·5–3 cm. in diam. with joints 25-30 cm. long. One sterile specimen from the Nicobars, which I have seen in the Calcutta Herbarium probably belongs to this species.

OBSERVATIONS.—Griffith, who has drawn up the description of this *Calamus* from a male plant native of the forests of Pegu and introduced into the Botanic Garden at Calcutta, says that it is a "tufted stemless species, with the habit of young specimens of *C. arborescens*," but he adds that it has "the flagellus humifuse or trailing over the neighbouring shrubs and armed with the usual prickles." From this it might be argued that this palm begins to flower when still in a young and stemless state and becomes a climber as it grows older.

Kurz has described his *C. tigrinus* (which without hesitation I consider the same as *C. longisetus*) on fruiting spadices only, and says that it is a large scandent rattan. It is a very distinct species by its peculiarly spotted fruits, very large male spikelets and flowers very much like those of *C. erectus*. The male spadix simply decompound is not of very common occurrence amongst the *Calami*.

PLATE 9.—Calamus longisetus *Griff.* Male partial inflorescence from a specimen in the Calc. Herb. collected at Port Mouat ravine in the South Andamans; partial inflorescence with young fruit and lower portion of a leaf from the Andamanese specimens forwarded to me by Mr. Man; the portion of a spikelet with ripe fruit,

the entire seed laterally seen and in vertical section, from Kurz's authentic specimen of his *C. tigrinus*.

6. CALAMUS THWAITESII Becc. in Hook. f. Fl. Brit. Ind. vi, 441, and in Rec. Bot. Surv. Ind. ii, 199.

C. longisetus Thw. Enum. Plant. Zeyl., 330 (not of Griffith).

DESCRIPTION.—Large and probably high scandent. *Leaf-sheaths* not seen, very probably sometimes flagelliferous. *Leaves* large, not cirriferous; petiole armed with straight, black, laminar, seriate spines which are very much the same as in *C. longisetus;* rachis in its first portion channelled above and with spinulous side-angles, from the middle upwards trigonous, bifaced above, flat beneath, where armed throughout with solitary rather distant claws, at least in leaves of the upper part of the plant; leaflets large, irregularly fascicled in groups of 2–3 on each side, the groups nearly opposite, with rather long vacant spaces between each pair of groups, upwards, mainly near the summit, more regularly set and nearly equidistant, rather firmly papyraceous, longitudinally plicate, shining above, green on both surfaces, very narrowly lanceolate or ensiform, gradually narrowed to the base, the margins ciliate throughout, almost from the base, with approximate, short, black, spreading, subspiny bristles; the mid-rib acute and prominent above, weaker below, furnished on both surfaces, but chiefly on the lower one, with black, short, subspiny bristles; secondary nerves (coinciding with the plicæ) slender, 1–2 on each side of the midrib, naked on both surfaces; transverse veinlets minute and crowded; the largest leaflets seen by me (probably the mesial) 60–70 cm. long and 4–4·5 cm. broad, the upper gradually shorter and narrower, the two of the apical pair the smallest and confluent at the base. *Male* and *female spadices* very similar and simply decompound, elongate, flagelliform, with the partial inflorescences very remote (60–80 cm. apart) and the axial portion interposed amongst them flat or rather concave on the inner side and convex on the back, where it is strongly armed with rather approximate half-whorls of stout black-tipped claws which gradually become smaller and more scattered on the spathes; primary spathes very long, tubular, closely sheathing, thinly coriaceous, armed with short-hooked black-tipped prickles, withered and lacerated near the mouth; partial inflorescences up to 60 cm. long, bearing 4–6 (and perhaps sometimes more) spikelets on each side and terminating in a rather long and slender appendix; secondary spathes tubular-infundibuliform, about 4 cm. long, somewhat enlarged above, obliquely truncate at the mouth and acuminate at one side where ultimately decayed and lacerated, usually sprinkled upwards with very short tubercular spines, but occasionally smooth; male spikelets inserted inside near the mouth of their respective spathes at an angle of about 45°, large, flattened, 10–15 cm. long, with 20–30 distichous flowers on each side; spathels broadly and asymmetrically infundibuliform, truncate, split under the flower and not prolonged into a point; involucre almost entirely included in its own spathel and attached at the base of the one above, cupular, obliquely truncate, two-keeled and lunately emarginate on the side next to the axis. *Male flowers* large (not seen fully developed), ovate when in bud, with the calyx three-toothed, very finely striately veined as are the spathels. *Female spikelets* 10–30 cm. long; spathels infundibuliform, truncate, prolonged at one side into a triangular, ultimately marcescent point;

involucrophorum short, cupular, truncate, exserted from its own spathel and attached at the base of the one above, acutely two-keeled on the side next to the axis; involucre regularly cupular, rather deep, scarcely longer than the involucrophorum, truncate, entire or faintly emarginate on the side of the neuter flower, of which the areola is distinctly lunate, rather concave and sharply bordered. *Female flowers* ovate and 7–8 mm. long; the calyx with 3 ovate acute teeth; the corolla divided almost to the base into three lanceolate acute segments slightly longer than the calyx; the stamens with filaments united by their bases and forming a short ring, triangular and subulate in the free portion. *Fruiting perianth* not pedicelliform; its calyx somewhat hardened and callous at the base, but almost entirely split into three pieces. *Fruit* ellipsoid-obovoid, subturbinate and slightly tapering towards the base, suddenly contracted at the apex into a stout and rather long conical beak, 22–25 mm. long, 12–15 mm. in diameter; scales in 12 longitudinal series, the largest 7 mm. long and not quite so much in breadth, convex, broadly channelled along the middle, yellowish-brown or yellowish-reddish with a dark marginal line and very finely erosely ciliated, not fringed, margins. *Seed* (when freed from the dry, certainly once fleshy, coat) ovoid, very slightly compressed, 15 mm. long, 10 mm. wide, 7 mm. thick, with obtuse apex and flat base, uneven or indistinctly pitted on the back, convex on the raphal side and with a very deep narrow circular chalazal fovea above the centre; albumen equable; embryo perfectly basal.

HABITAT.—Ceylon: in the Hantani district of the Central Provinces at an elevation of 2,000 to 3,000 feet (*Thwaites* C. P. No. 2873).

OBSERVATIONS.—This is quite distinct from *C. longisetus* by the different shape of the fruit scales. It seems more nearly related to *C. arborescens* than to *C. longisetus*, but this is an erect species with leaflets white beneath, and with the axial portions of the spadix not clawed. From *C. erectus* and allied species it is separated by its seed with equable albumen.

The spadix of the Ceylon plant (No. 2873 in the St. Petersburg Herbarium) is accompanied with a portion of a leaf which seems a radical one (or that of a young plant) with the upper part of the petiole; this is terete and is armed, as in the first portion of the rachis beneath, with three-fourths whorls of numerous slender long straight spines; the petiole and rachis are covered with removable grey scurf.

PLATE 10.—Calamus Thwaitesii *Becc.* Lower portion of a male partial inflorescence, with flowers not fully developed and lower portion of a (radical ?) leaf, from C. P. No. 2873 in St. Petersburg Herbarium.

PLATE 11.—Calamus Thwaitesii *Becc.* A partial inflorescence with not quite ripe fruit and a portion of a leaf from near its base (seen from the upper surface), from C. P. No. 2873 in Herb. de Cand.; a spikelet with full-grown fruit; detached fruits; one seed entire and another in longitudinal section from C. P. No. 2873 in St. Petersburg Herbarium.

CALAMUS THWAITESII Becc. *var.* CANARANUS Becc.

DESCRIPTION.—*Leaves* as in type, but slightly paler beneath than above; in the small portion seen by me the leaf-rachis is armed beneath with small straight ternate deflexed black spines. *Male spadix* elongate flagelliform; its lower partial inflorescences elongate (in one specimen 70 cm. long with 11–12 spikelets on each side) and terminating in a small, unarmed, inconspicuous, tail-like appendix; secondary spathes tubular, narrow and closely sheathing at the base, somewhat enlarged above where usually split on the ventral side, and embracing with their expanded, exsuccous, triangular apices the base of their respective spikelets; spikelets large, the lower ones 10–12 cm. long, 1 cm. broad, with very numerous and very approximate flatly bifarious flowers (as many as 40 on each side); upper primary inflorescences with fewer and sometimes much shorter spikelets, and these often with a scorpioid tendency; spathels very shortly and broadly asymmetrically infundibuliform. *Male flowers* (full-grown) narrowly oblong, 8–10 mm. long, 3 mm. broad, obsoletely trigonous, conically narrowed to the summit and sometimes slightly curved; the calyx tubular-campanulate, shortly and broadly 3-toothed; the corolla (during anthesis) almost three times as long as the calyx. *Female spadix* as in the Ceylon plant; spathes tubular-infundibuliform, truncate and entire at the mouth, very slightly prolonged at one side into a broadly triangular point. *Fruit* more or less obovoid, turbinate, very suddenly beaked, 20–25 mm. long (including the beak and the perianth), 15 mm. thick. *Seed* suborbicular, 12 mm. long, 11 mm. broad, somewhat flattened or lenticular, 6 mm. thick with a rather acute margin all round.

HABITAT.—Southern India; Canara district, at Marmagoa, near seashore, (*Talbot* No. 2854 ♂); Ainshi Ghat, (*Talbot* No. 2855), and Keldra, (*Talbot* No. 2856, in Herb. Kew).

OBSERVATIONS.—The male spadix of this variety at first sight looks very different from that of the Ceylon plant, on account of its spikelets which are shorter and at the same time with more numerous and more approximate flowers. The fruit however is externally exactly similar to that of the Ceylon plant, as already stated by Sir J. Hooker (*Fl. Brit. Ind.* vi, 441), but the seed is more flattened, almost lenticular and with a rather sharp edge all round. The portions of leaves which accompany Talbot's specimens of the spadix have grouped leaflets and the rachis armed beneath not with claws but with small, slender, ternate, deflexed, straight, black spines, probably because the said portions belong to radical leaves or to those of the lower part of the plant. The specimen of a male spadix with curved male flowers, $\frac{1}{4}$ inch long, that Sir J. Hooker mentions under *C. pseudo-tenuis* (l. c., 445), and that I have seen, belongs to the var. *canaranus* of *C. Thwaitesii.*

PLATE 12.—Calamus Thwaitesii *Becc.* VAR. canaranus *Becc.* Partial male inflorescence and portion of a leaf (under surface) from Marmagoa (Talbot No. 2854 in Herb. Kew); spikelet with mature fruit and seed in lonigtudinal section through the embryo, from Ainshi Ghat, N. Kanara, (Talbot No. 2855 in Herb. Kew).

7. CALAMUS RUDENTUM Lour. Fl. Cochinchin. 1st edit. i, 209, and 2nd edit., 260 (excl. Rumph. syn.); Willd. Spec. ii, 203; Lam. Encycl. vii, 304; Rees Cycl. No. 2; Roem. & Schult. Syst. vii, 1327; Martius Hist. Nat. Palm. iii, 1st edit., 211 (excl. all syn.) and 340; Walp. Ann. iii, 49, and v, 831; Miq. Fl. Ind. Bat. iii, 139; H. Wendl. in Kerch. Palm. 237 Becc. in Rec. Bot. Surv. Ind. ii, 199.

DESCRIPTION.—Scandent. *Stem* very long and robust. *Leaf-sheaths* not seen, but very probably flagelliferous. *Leaves* very large, non-cirriferous; petiole . . . . .; rachis trigonous in the mesial and upper portion, with acute and smooth angles and two flat side-faces above, flat and armed beneath with solitary, rather strong, straight, slightly deflexed spines, which rest on a swollen base; leaflets numerous, equidistant, alternate, very long, linear-ensiform, the largest 65 cm. in length by 15–18 mm. in breadth, stiffly papyraceous, plicate along the secondary nerves, shining and green on both surfaces, narrowed to the base, gradually acuminate towards the apex which is acute in the lower leaflets and obtuse acutely keeled above and bristly penicillate at the apex in the upper ones; the mid-rib acute and spinulous towards the apex above, and from the middle upwards furnished below with some very long (1–2 cm.) spadiceous bristles; secondary nerves few, slender, naked on both surfaces; margins acute, bearing short adpressed spinules 10–12 mm. apart, closer, longer and more spreading upwards; transverse veinlets very crowded, rather sharp and frequently anastomosing; the two apical leaflets smaller than the others and shortly connate at the base. *Male spadix* ultradecompound, flagelliform, excessively long; the one measured, though without its basal portion, 3·5 m. in length and further lengthened out into an apical flagellum measuring another metre; the vacant spaces between two inflorescences very long, and armed (as is the flagellum) with half-whorls of stout black-tipped claws resting on broad and confluent bases; partial inflorescences rather many (6 in the spadix mentioned above), the uppermost rudimentary, the lowest, the largest, 60 cm. long, twice branched near the base and with single spikelets in the upper portion; primary spathes cylindrical, very long tubular, closely sheathing, often ultimately split longitudinally, strongly clawed especially in their lower portion, terminating in a lanceolate sparsely aculeate limb which is not lacerated, but often at length decayed and partially deciduous at the summit; secondary spathes finely furfuraceous, unarmed or sparingly spiny-tuberculose, 15–20 mm. long, tubular, slightly enlarged above, truncate, entire and not ciliate at the mouth where lengthened on one side into a short triangular acute point; male spikelets reddish-brown when dry, attached immediately above the mouth of their own spathe, spreading or recurved, flattened, 7–11 cm. long with 20–30 bifarious contiguous flowers on each side, inserted at an angle of about 45°; spathels finely furfuraceous, short, broadly and asymmetrically infundibuliform, truncate and entire at the mouth, shortly apiculate at one side; involucre slightly longer than its own spathel and attached to the base of the one above, like a swallow's nest or dimidiately cupular, obliquely truncate, emarginate, two-keeled and two-toothed on the side next to the axis. *Male flowers* 6 mm. long, elongate-ovoid, obtusely trigonous, somewhat attenuated at the apex; calyx campanulate, striately-nerved, with three broad apiculate lobes; corolla twice as long at the calyx, divided down to the base into three lanceolate rather obtuse segments; stamens with filament nearly free at the base, subulate and slightly inflected at the apex; anthers linear with their cells discrete from above the middle; rudimentary ovary very small, formed by three narrow scales not quite 1 mm. long. *Female spadix* simply decompound, with very elongate partial inflorescences, of which the largest, the lowest, is 1 m. in length, with 10–12 spikelets on each side; the upper 40–50 cm. long, with fewer spikelets; secondary spathes a little longer than in the male spadix, 2·5–3·5 cm. long, often split upwards; spikelets not pedicellate, inserted at the mouth of their own spathe, arched downwards, the largest, the lowest, 20–25 cm. long with 20–25 flowers on each side, those of the upper and more slender branches not more than 7–8 cm. in length with proportionally fewer flowers; spathels asymmetrically infundibuliform, truncate, entire, apiculate at one side; involucrophorum half-projecting from its own spathel and obliquely attached at the base of the one above, dimidiately cupular, two-keeled, emarginate and two-toothed on the side next to the axis; involucre not or slightly exceeding the involucrophorum, cupular, rather shallow, entire, superficially emarginate on the side of the neuter flower of which the areola is depressedly lunate. *Female flowers* inserted at an angle of 45°, ovate, 6 mm. long; the calyx divided more than halfway down into three, ovate, rather thick, somewhat obtuse lobes; corolla divided almost to the base into three, ovate-lanceolate, acute, striate segments a little longer than the calyx; stamens forming by the united bases of their filaments a cup which reaches to the middle of the corolla and is crowned by six, triangular, elongate and subulate teeth; fertilized ovaries subovoid, suddenly narrowed into a conic beak; scales in 12 series, shining, not channelled along the middle, straw-coloured, with a darker intramarginal line and ciliolate fimbriate margin, especially near the tip. *Fruit* not seen ripe; in the very young fruit the perianth is already split and not pedicelliform.

HABITAT.—Cochin-China (*Loureiro*). Rediscovered by Pierre at Dian-lau-me in the province of Bien-hoa in Lower Cochin-China (Herb. Pierre No. 4846); also near Tan Kiyen on the River Dong-nai (No. 4845) and near Mount Pong-lu in the province of Binh-Thuan.

According to Pierre the Annamite and Moi name for this *Calamus* is "Ke-wang." No. 4845 bears that of "May-chia-wang," which has some resemblance with that of "May saong" assigned by Loureiro.

The Rotang produced by this *Calamus* is of a good quality and much used by the natives for cables. Loureiro writes also of the uses of this species: Pronavium rudentibus; ad magna onera trahenda, ad elephanthos indomitos coercendos et alligandos."

OBSERVATIONS.—This species appears to be closely allied to *C. longisetus*, from which however it is certainly distinct by the much smaller male flowers, thinner female spikelets and much narrower leaflets. It appears to me that we can recognize in the specimens of Pierre, Nos. 4845, 4846, the *C. rudentum* of Loureiro, not so much from the characters given by this author, which are quite insufficient for the recognition of any species of *Calamus*, as from the general notes. Loureiro assigns to *C. rudentum* the extraordinary length of 500 feet, but this is certainly an exaggeration.

This species seems rather variable, and amongst the specimens of Pierre those bearing the No. 4845 differ somewhat from the others, and have the leaflets more crowded towards the apex, shorter, broader (34–50 by 2·5 cm.) and less acuminate than in No. 4846; the rachis bears the impressions of the spines, which at least in the apical portion are ternate, the mesial 3 cm. long, the longest, straight, flat, narrow, yellowish with black tip. Some spikelets, mainly those near the apex, in a female spadix, bear male flowers only and are apparently fertile, but are more slender than those of the male spadix.

The *Calamus* named by Thwaites *C. rudentum* (Enum. Pl. Zeyl. 330) I have considered to be a new species (*C. zeylanicus* Becc.). *C. rudentum* of Roxb. (Fl. Ind. iii, 76) I have reduced to *C. albus* Pers. as to the Ceylon plant. *C. rudentum.* of Mart. (Hist. Nat. Palm. iii, 340) is *C. rivalis* Thw.

PLATE 13.—Calamus rudentum *Lour.* The terminal part of a male spadix; portion of a female partial inflorescence with ovaries in course of development; summit of a leaf seen from the lower surface; another portion of a leaf seen from above; very young fruits from Pierre's specimens in Herb. Becc.

8. CALAMUS LEPTOSPADIX Griff. in Calc. Journ. Nat. Hist. v, 49, and Palms. Brit. Ind. 60, t. cxciv A. B. C.; Mart. Hist. Nat. Palm. iii, 339, t. 175, f. ii and t. Z. xviii, f. xiii; Walp. Ann. iii, 485, and v, 830; T. And. in Journ. Linn. Soc. xi, 8; Gamble Man. Ind. Tim. 423; Hook. f. Fl. Brit. Ind. vi, 441; Becc. in Rec. Bot. Surv. Ind., ii, 199.

DESCRIPTION.—Scandent, long and slender. *Sheathed stem* 12–15 or at most 20 mm. in diam.; naked canes 8–10 mm. thick, with internodes 18–30 cm. long, slightly thickened at the joints, smooth and rather polished on the surface when freed from the scurf with which they are covered when with the sheaths on. *Leaf-sheaths* flagelliferous, ferrugineously scurfy, puckered above, armed with very variable, very short or 15–25 mm. long, straight, flat, narrow, subulate, horizontal or slightly deflexed, solitary or aggregate and even subwhorled spines. *Ocrea* very distinct, subcoriaceous, persistent, about 15 mm. in length, prickly-hispid especially on the margin. *Leaf-sheath flagella* slender, filiform, very long, flattened and smooth in the lower portion, in the upper part armed with weak scattered claws. *Leaves* rather delicate, from 60 cm. to 1 m. in length, more or less covered when young with a cottony-ferrugineous deciduous scurf on the petiole and mainly on the rachis; petiole short (in full-grown plants), rounded beneath where armed with few deflexed spines, channelled above near the base, then flat, armed on the margins with some rare straight spines, otherwise nearly smooth; in young plants the petiole is longer, sparingly armed with straight, horizontal, (2–3 cm. long) spines; rachis with a very acute and raised angle and two flat side-faces above, rounded below in its lower portion, flattish upwards and armed throughout along the middle with long, straight deflexed, always solitary spines which gradually pass into claws towards the apex; this however, occasionally smooth; leaflets numerous, rather closely set and very regularly equidistant, alternate or subopposite, broadly linear or linear-ensiform, slightly attenuated at the base, gradually acuminate into a bristly subulate apex, almost the same colour on both surfaces, distinctly 3-costate above; the mid-costa stronger than the side ones, all three equally furnished with closely set bristles; margins densely ciliate with much-adpressed hairs, which are closer and longer towards the apex; the largest leaflets, those not very far from the base and in the largest specimens 20–30 cm. long by 10–14 mm.; the upper gradually shorter and very often opposite, less acuminate at the apex, but more bristly there than the others; the terminal pair free from the base and very small. *Male spadix* simply decompound, very long, excessively slender and prolonged into a filiform clawed flagellum; partial inflorescences not many, very distant, very strict, slender, 20–40 cm. long, bearing on each side 10–20 adpressed spikelets; primary spathes narrow, tubular, closely sheathing, the lowest flattened, acutely two-keeled, scarcely armed on the back with some short spines; the secondary less flattened, very narrow and also very long, the upper cylindraceous, 30–40 cm. long, narrowed towards the base, where flat and smooth on the inner side, rather strongly clawed and externally produced at the apex into a lanceolate acute limb keeled on the back; secondary spathes tubular at the base and enlarged above into an ovate-lanceolate, long-acuminate, auriculiform, smooth limb which is keeled on the back and embraces the base of the spikes and terminates in a small brushed deciduous appendix 2–3 mm. long; spikelets curved or distinctly scorpioid, especially when young, arising distichously from the interior of their respective spathes, short (1–2 cm. long), the lowest the largest, with 6–12 bifarious, closely set and nearly horizontal flowers on each side; spathels very crowded, membranous, very broad, spoon-shaped, amplectent, acute, often penicillate-furfuraceous at the apex; involucre cupular, rather deep, obliquely truncate, flat and sharply two-keeled on the side next to the axis. *Male flowers* (full-grown buds) oblong, rather obtuse, 4–4·5 mm. long, about 1·5 mm. broad; calyx tubular-campanulate, striate, divided down about to the middle into 3 broad, finely striately veined and rather obtuse or apiculate lobes; corolla twice as long as the calyx at most, divided down to two-thirds into three oblong acute segments; filaments of the stamens subulate with inflected apex and united by their base to the tubular part of the corolla; anthers versatile, linear, sagittate, apiculate; rudimentary ovary formed by three subulate bodies, reaching to the base of the anthers. *Female spadix* very similar to the male, the one measured 4 m. in length (including the slender filiform flagellum 60 cm. long) and with five partial inflorescences; spikelets arising erect from the spathes and slightly outwardly curved, 15–20 mm. long, with the flowers when young distinctly arranged in four series, of which two are of fertile female and two of sterile or neuter flowers, these last scarcely smaller than the others, each series composed of 5–8 flowers in the largest, the lowest, spikelets; spathels as in the male spadix, but deeper; involucrophorum anticously split and posticously discrete as if formed by two small bracts connate by their bases; involucre rather deep, obliquely truncate and laterally evolute on the side of the neuter flower, of which the areola is broadly ovate or nearly circular with sharply defined borders. *Female flowers* ovoid, about 3–3·5 mm. long, with the corolla a little longer than the calyx. *Fruiting perianth* not pedicelliform, split and spreading under the fruit. *Fruit* globose or globose-ovoid, about 10 mm. in diam., mammillate-apiculate; scales in 18 series, not channelled along the middle, yellowish with a conspicuous reddish-brown marginal line, broader towards the point, of which the extreme tip is pale, scarious, obtuse and not fimbriate; margins unequally erose. *Seed* irregularly globular, 8 mm. long and 6·5 mm. thick, shining, yellowish-brown when freed from the scanty coat with which it is enveloped, convex and coarsely alveolate on the back, marked on the ventral face with some superficial furrows radiating from the chalazal fovea, which is central, circular, rather deep and continued down to the base in a channel ending at the embryo; albumen equable.

HABITAT.—N. E. India: Khasia Hills in Assam (*Griffith*, *Hooker f.* & *Thomson*). G. Mann from Assam sent me some complete specimens gathered at about 1000 m above sea-level. In Manipur and on the Naga Hills (*G. Watt* No. 7459). Sikkim (*Hooker f.* & *Thomson; Treutler* in Herb. Kew and Herb. St. Petersb.; *Gamble*). Buxa Reserve in the West Duars (*Gamble*). T. Anderson (l. c.) says that "this species occurs in most of the deep valleys of the outer ranges of the Sikkim Himalaya, and extends into the interior along the course of the larger rivers and their tributaries . . . . . The canes are soft and useless. The Lepcha name of this *Calamus* is 'Lat.' In Nepal according to Gamble it is called 'Dangri Beṭ' and at Kurseong 'Rani' or 'Rabi Beṭ' (*Burkill*).

Observations.—A very well-marked delicate species, distinguished by its very long, simply decompound, extremely narrow spadices very much the same in both sexes, and with long, strict, partial inflorescences bearing numerous short spikelets which are decidedly scorpioid in the male spadix. Anderson (l. c.) says of this *Calamus* that "it is somewhat gregarious in its habit. The long slender stems, when lying on the ground, send out short leafy shoots from their joints and form a thicket of prickly leaves. The flowering extremities of these prostrate stems ascend the trees by the assistance of the strongly barbed straight tendrils springing from the sheaths of the leaves."

Plate 14.—Calamus leptospadix *Griff.* Intermediate portion of a leaf (seen from above) and partial inflorescence (both on the right-hand side), from a specimen collected by Sir D. Brandis on the Teesta (Herb. Becc.); apex of a leaf (on the left side) seen from the lower surface; leaf-sheath and a nearly entire spadix from the Khasia Hills (Herb. Becc.); apex of a leaf-sheath with large ocrea and base of the petiole from a young plant (on the right hand lower corner). Fruits and seeds (from the Calcutta Botanic Garden).

9. Calamus dilaceratus Becc. in Rec. Bot. Surv. Ind. ii, 198.

Description.—Tufted, probably not scandent. *Leaves:* the only one seen supposed to belong to the spadix hereafter described, and probably a radical one, is 3 m. long and has the apical portion in a decayed condition, but apparently not cirriferous. Its sheath is not completely tubular, but opened on the ventral side and is densely armed throughout with very thin, black, criniform, friable, straight spicules of unequal length (the largest 4–5 cm. long), confluent at their bases and arranged in rather crowded oblique series; the petiole is very long (about 1 m.), subterete, faintly channelled on the upper surface of the lower portion, sparingly tubercled-spinulous; the rachis is rounded below and sprinkled there with some small subspinous tubercles, with an acute angle and two flat side-faces above; leaflets very many, equidistant, rather crowded (about 2 cm. apart), linear-ensiform, very acuminate, thinly papyraceous, the largest, the mesial, 35–40 cm. long by 1·5 cm., green, subconcolorous on both surfaces, with three rather acute costæ above, of which the central is bristly-spinulous near the apex and the lateral furnished with few short black setæ; beneath, all nerves are very faint, the central rather densely, and one on each side of this sparingly setiferous. *Male spadix* . . . *Female spadix* decompound, rather large, panicled, not flagelliferous, with many partial inflorescences; primary spathes not very long, tubular-infundibuliform, dry, somewhat enlarged in the upper half or third, where in the fruiting stage discoloured, decayed and lacerated, armed with small, straight, somewhat deflexed spicules which rest on a bulbiform base; partial inflorescences erect-spreading, 25–35 cm. long, bearing distichously on each side 8–10 spikelets which are 4-7 cm. long and furnished with a slender flattened pedicellar portion (1–1·5 cm. long) attached to the bottom of their respective spathe; secondary spathes thinly coriaceous or submembranous, tubular-infundibuliform, 1·5–2 cm. long, more or less split down to the base, naked or sparingly spiculose, extended at one side into a rather long point; spathels shortly infundibuliform, almost auriculiform, acute at one side, ultimately more or less split; involucrophorum inserted at the bottom of its respective spathels, not laterally attached at the base of the one above, spathaceous-auriculiform, acute, dorsally two-keeled; involucre also spathaceous-auriculiform, acute at one side; areola of the neuter flower elongate, lanceolate, sharply bordered. *Female flowers* about 6 mm. long. *Fruiting perianth* not pedicelliform; its calyx and corolla almost similar, divided down to the base into three lanceolate finely striate lobes of equal length and breadth; staminodes persistent, reaching to about the middle of the corolla with the filaments acuminate from a very broad base and furnished with a small sagittate anther. *Fruit* small, broadly ovate, 12 mm. long by 9 mm., very suddenly contracted into a short but thick beak or mucro; scales small, in 21 longitudinal series, pale-yellowish, shining, channelled along the middle, with brown and finely fimbriate tip. *Seed* subglobose, slightly compressed, flattish or slightly depressed on the raphal side and convex on the back, equally rounded at both ends, with equal and not pitted surface, 8 mm. long by 6–6·5 mm. thick; albumen homogeneous; embryo basilar. All parts of the spadix, the secondary spathes, spathels and other appendices and parts of the flowers in the fruiting stage acquire a chestnut-brown colour when dry, and show traces of a tobacco-coloured scurf and are more or less split or lacerated.

HABITAT.—The Nicobar Islands, where it was found by Mr. E. H. Man, who sent me the specimens described above in August 1888.

OBSERVATIONS.—The leaf I have described was detached from the specimen of the spadix, without any reference to this; but the spines with which the petiole is armed are very much like those that cover the spathes and show almost certainly that this leaf belongs to that spadix, and besides that this *Calamus* is erect or bushy and not scandent.

PLATE 15.—Calamus dilaceratus *Becc.* The upper part of a spadix with almost ripe fruit, from Mr. Man's specimens in Herb. Becc.

10. **CALAMUS CASTANEUS** Griff. in Calc. Journ. Nat. Hist. v, 28, var. B, and Palms Brit. India, 37, t. clxxxv. C. (and A. B.?); Mart. Hist. Nat. Palm. iii, 331, t. Z xviii, f. xxii and Z xxi, f. ii and Z xxii, f. xv; Walp. Ann. iii, 482, and v, 829; Miq. Fl. Ind. Bat. iii, 112; H. Wendl. in Kerch. Palm. 235 (excl. syn.); Hook. f. Fl. Brit. Ind. vi, 440; Becc. in Rec. Bot. Surv. Ind. ii, 198.

DESCRIPTION.—Erect, 1–1·5 m. high. *Sheathed stem* 7–10 cm. in diam. *Leaf-sheaths* not flagelliferous, truncate at the mouth, not ocreate or ligulate (at least in full-grown leaves), very densely armed with flat, very acuminate, often sinuous, dark-grey spines which are as much as 6–7 cm. long and are intermingled with smaller ones of the same shape. *Leaves* not cirriferous, large, 1·5–2 m. long; petiole very stout and long (60–70 cm.), 2 cm. thick, faintly channelled at the base and flat upwards above, where more or less armed with straight erect spines, rounded underneath where armed along the middle with straight horizontal spines and on the margins with the same kind of straight, long and closely set spines pointing in different directions and intermixed with much shorter ones; rachis in the intermediate and upper portion trigonous, acutely bifaced and smooth above, roundish near the base below, where armed with distant solitary, short, horizontal or slightly deflexed spines, flat and unarmed near the apex; leaflets green on both surfaces, slightly paler beneath, numerous, equidistant, alternate or subopposite (at least in the portions seen), narrowly lanceolate or broadly ensiform, somewhat narrowed at the base, gradually acuminate to a spinulous apex; mid-costa acute above, bearing on both surfaces, mainly towards the apex, few short bristly spinules; secondary nerves 2–3 on each side of the mid-costa, rather distinct and naked on both surfaces, margins finely and acutely spinulous, transverse veinlets indistinct; the largest leaflets 60 cm. long and 4–5·5 cm. broad; the terminal pair smaller than the others. *Male spadix* . . . . . *Female spadix* not seen entire; partial inflorescences about 40 cm. long, bearing 7–8 spikelets on each side; secondary spathes thinly coriaceous, elongate-infundibuliform, loosely sheathing, unarmed, prolonged into a lanceolate-auriculiform limb, ultimately withered and decayed at the apex, but not fibrous; spikelets large and thick, 12–17 cm. long, spreading, furnished with a peduncular part 1·5–2 cm. long, by which they are attached inside and at the bottom of their own spathe; spathels covered with a very thin adherent brown indumentum, broadly and symmetrically infundibuliform, and having a rather loose entire or later irregularly split limb, which is prolonged at one side into a triangular ultimately decayed point; involucrophorum spathaceous, irregularly split, attenuate at the base, attached inside and at the bottom of its own spathel, flattish and two-keeled on the side next to the axis; involucre not or slightly exceeding the involucrophorum, subcupular, more or less irregularly split; areola of the neuter flower vertically ovate and acute. *Female flowers* 5 mm. long. *Fruiting perianth* not pedicelliform; its calyx not thickened or callous at the base, entirely split into three lanceolate acuminate lobes; the segments of the corolla scarcely longer than the calyx; filaments with stamens highly connate at the base and in the free portion elongately triangular. *Fruit* ellipsoid, ovate or obovate, rounded at the base and suddenly narrowed at the top into a rather long beak, 13 mm. broad and 22–24 mm. long (including the beak), of uniform chestnut-brown or chocolate colour; scales small, in 24–27 longitudinal series, about 2 mm. broad and scarcely less in length, narrowly channelled along the middle, dull and under a strong lens finely scabridulous, with slightly paler, finely erose margins and obtuse tip. *Seed* not seen perfectly mature. The plant acquires in drying a reddish-brown colour.

HABITAT.—The Malayan Peninsula; in thick jungles about Malacca (*Griffith, Maingay* No. 1533 in H. K.), and in the district of Perak on the hills of Larut between 150–200 metres above the level of the sea (Herb. Calc. No. 5880).

OBSERVATIONS.—My description of this species is founded on the fruiting specimen No. 5880 of the Calcutta Herbarium, not taking into account all the others, not being sure that some mixture had not occurred among the different parts of this species with those of *C. Griffithianus.* The fruit of *C. castaneus* figured by Griffith, which I have seen on a portion of the authentic specimen preserved at Kew, is more globose than that I have described, but the shape of the fruit in this species, as in *C. Griffithianus,* seems very variable in the different stages of its development.

Griffith has described and figured the male spadix of *C. castaneus;* but as this author had not distinguished this species from the closely allied *C. Griffithianus,* it is not exactly known to which of the two species such description and figures belong; but probably the male spadix differs very little in the two species. The leaflets of the said specimen No. 5880 belong to a full-grown leaf and do not show any trace of the peculiar thin purpurascent coating on the lower surface, which may be seen in the young leaves of *C. Griffithianus.* The leaflets of *C. castaneus* are broader than those of *C. Griffithianus,* bristly only on the mid-costa, and probably equidistant; but the fragments of leaves seen are too short to be sure of this characteristic. Sir George King's collector in the label to the specimens of *C. Griffithianus* and *C. castaneus* had also pointed out the main differences between the two species. Indeed *C. Griffithianus* has a stem creeping at first and then ascendent and has terete petioles; on the contrary *C. castaneus* has a short erect stem and petioles channelled at the base and flat upwards above and rounded beneath.

PLATE 16.—Calamus castaneus *Griff.* Upper portion of a leaf-sheath with the base of the petiole; portion of a leaf from about its intermediate part; portion of the female spadix with unripe fruit: all these figures from a specimen bearing the No. 5880 in Herb. Calc. The portions of male spadix (on the right hand side) and of the female one (on the left), the ripe fruit, the seed entire and the one in section in the upper part of the plate are from Scortechini's specimens which I doubtfully refer to *C. castuneus,* these parts not being accompanied by the leaves and it being very difficult to distinguish *C. castaneus* from *C. Griffithianus* by the reproductive organs only.

11. CALAMUS GRIFFITHIANUS Mart. Hist. Nat. Palm. iii, t. 332, Zxviii, f. xxvii, and Zxxi, f. xiv; Walp. Ann., iii, 482 and v, 829; Miq. Fl. Ind. Bat. iii, 112; Hook. f. Fl. Brit. Ind. vi, 440; Becc. in Rec. Bot. Surv. Ind. ii, 198.

C. castaneus (partly) Griff. in Calc. Journ. Nat. Hist. iv, 29, and Palms Brit. Ind. 38; Ridley in Trans. Linn. Soc. Bot., iii, pt. ix, 392.

DESCRIPTION.—*Stem* creeping, rooting at the joints and then ascending erect, about 3 cm. in diam. *Leaf-sheaths* not flagelliferous, armed with straight, long, unequal, laminar, subulate spines, which are scattered or more or less aggregate and remotely obliquely seriate. *Leaves* large, 2–3 m. long, not cirriferous; petiole from 60 cm. to 1 m. in length, subterete (at least in its upper portion), 12–13 mm. in diam., armed with laminar, elastic, horizontal spines of various sizes, 2–5 cm. long and sometimes considerably longer, very irregularly scattered or, as on the leaf-sheaths, aggregate and more or less seriate; rachis from the middle upwards trigonous, bifaced above and often but not always spinulous on the upper angle, more or less armed below, chiefly in its lower portion, with solitary aggregate or pectinate straight spines; leaflets arranged in alternate groups of many, being in each group equidistant and not clustered, elongate-ensiform and glossy, 45–65 cm. long and 15–35 mm. broad, green above, paler underneath where—at least when young—covered with a very thin mealy-violaceous coating; mid-costa prominent above, bristly towards the apex on both surfaces; secondary nerves rather distinct, one on each side of the mid-costa naked above and conspicuously covered beneath with rather long bristles; transverse veinlets fine, much interrupted; margins appressedly and finely spinulous. *Male spadix* 0·8–1m. long, ultradecompound, not flagelliferous, with many partial inflorescences or primary branches, variously spreading or nodding, inserted inside their own spathe and pedicellate; each branch also pedicellate and inserted inside its own spathe, divided again into 6–10 secondary branchlets or compound spikes which are 8–15 cm. long and bear distichously 2–5 recurved or scorpioid spikelets and decrease in length from the base of the branchlet towards its apex; the apical spikelet, which is the continuation of the axis is much longer and larger than the side ones and has larger spathels and flowers; primary spathes relatively short, tubular at the base, enlarged and somewhat inflated upwards, with an auriculiform often longitudinally split limb, half-decayed upwards where usually sharply defined from the still living basal portion by a transverse slightly prominent line; secondary spathes (spathes of the compound spikes) short, broadly and asymmetrically infundibuliform, truncate, with the point somewhat decayed and split; side spikelets 2–6 cm. long, curved or scorpioid, flattened, about 1 cm. broad (including the flowers), their spathels very closely packed, shallow, nearly boat-shaped, prolonged on one side under the flower into a broadly triangular acute point; involucre cupular, half-immersed in its own spathel and attached to its base, acutely two-keeled, deeply emarginate and two-toothed on the side next to the axis, anticously obliquely truncate or more often split and apparently formed by two connate bracts. *Male flowers* slender, 5–5·5 mm. long; calyx tubular, slightly angular from pressure, with three rather acute finely striate lobes, ultimately cleft down to the base; corolla a little longer than the calyx, deeply divided into three linear-lanceolate segments; stamens with filaments united to the base of the corolla, rather thick, subulate with inflexed apex; anthers sagittate, acute; rudimentary ovary composed of three elongate subulate bodies. *Female spadix* short, erect, 40–50 cm. long, panicled, not flagelliferous or appendiculate, with a flattened peduncular part, 20–25 cm. long, closely sheathed with short obliquely truncate spathes, unarmed or nearly so; partial inflorescences few (2–4), each bearing subdistichously or somewhat irregularly 5–6 spreading flexuose spikelets, 8–12 cm. long, inserted inside their own spathe and pedicellate; spathels broadly and asymmetrically infundibuliform or obconic, occasionally more or less split, prolonged on one side under the flowers into a triangular ultimately decayed point; involucrophorum inserted inside its own spathel and shortly pedicellate, spathaceous, unilaterally auriculiform, anticously split and opened, acutely keeled on the side next the axis; involucre included in the involucrophorum, subcupuliform, truncate, ultimately radiately split, the areola of the neuter flower vertically lanceolate-ovate, acute and sharply bordered. *Female flowers* elongate conical, finely striate; their calyx divided almost to the base into three ovate-lanceolate acute lobes; corolla very similar to the calyx and almost as long but with narrower segments; stamens as long as the corolla, with filaments highly connate and forming a long campanulate urceolum which reaches and even surpasses the middle of the corolla and is crowned with 6 triangular teeth; anthers broadly sagittate; stigmas thick, lamellose, recurved. *Neuter flowers* finely striately veined externally, very similar to and about as long as the male ones (6 mm. long) but a good deal thinner; the calyx at first tubular and shortly 3-toothed, then cleft almost to the base into 3 lanceolate parts; the corolla slightly longer than the calyx and divided down almost to the base into 3 linear-lanceolate acute segments; stamens with the filaments subulate, united by their bases and shortly inflexed at the apex, almost as long as the petals; anthers linear, abortive, versatile; rudimentary ovary narrowly elongate, 3-dentate, slightly shorter than the stamens. *Fruiting perianth* not pedicelliform. *Fruit* ovate-oblong or subglobose-obovate, very suddenly and conspicuously beaked or rostrate, 20–22 mm. long and 14–16 mm. in diam.; scales chestnut-brown, in 18–24 longitudinal series, narrowly channelled along the middle, dull and under a strong lens finely scabridulous with slightly paler finely erose margins and short obtuse point. *Seed*, when freed from the dry (once fleshy) coat, lenticular, 14–15 mm. long, 12–13 mm. wide, 7 mm. thick, somewhat convex, sinuately rugose and superficially pitted on the back, with a small, round, shallow, chalazal fovea in the centre of the flattish raphal face; albumen equable; embryo basilar.—All parts of the male and female spadix, including the flowers and fruits, of a uniform brown chestnut colour when dry.

HABITAT.—The Malay Peninsula near Malacca (*Griffith; Ridley* No. 842); near Perak (*Scortechini*); at Larut in open jungle on hilly rocky localities between 60 and 250 metres above the sea (*King's collector* No. 3040 Herb. Hort. Calc.); in Selangor (*Ridley* Nos. 3417 and 3478).

OBSERVATIONS.—I have derived my description from Scortechini's incomplete specimens and from the No. 3040 of the Calcutta Herbarium. In some of Scortechini's specimens the spines on the petiole (probably of a leaf from a young plant) are excessively long (7–15 cm.) and the rachis in the upper angle is not spinulous. *C. Griffithianus* differs from *C. castaneus* in its smaller dimensions, ascendent stem, less densely and seriately armed leaf-sheaths, but chiefly in the petiole which is nearly cylindric upwards, and in the leaflets with 3 nerves, which are bristly underneath, while in *C. castaneus* the mid-costa only bears bristles there and the petiole is plano-convex in transverse section. The leaflets in *C. Griffithianus* are also distinctly disposed in large groups and probably in *C. castaneus* are equidistant, but of this last species I had not the opportunity of seeing an entire leaf. The number of longitudinal series of the scales of the fruit seems a very variable character in this species as is also the more or less roundish shape of the fruit.

Some specimens of a *Calamus* from the western side of the Malayan Peninsula sent to me by Mr. H. N. Ridley undoubtedly belong to *C. Griffithianus;* consequently I suppose that the *C. castaneus* from Tahan woods quoted by that author in his memoir on the "Flora of the Eastern Coast of the Malay Peninsula"

(*Trans. Linn. Soc. London*, Botany iii, pt. 9, 392) may possibly be reduced to *C. Griffithianus*. *C. Griffithianus* seems a much commoner species than *C. castaneus*.

The natural affinities of *C. castaneus* and *C. Griffithianus* are probably with *C. ovoideus* and *C. andamanicus*, which, however, have cirriferous leaves.

PLATE 17.—Calamus Griffithianus *Mart.* Basal portion of a leaf with the upper part of the petiole; three leaflets from near the apex showing the upper surface; an entire fruiting spadix; flowers, fruits and seed (one in longitudinal section) from the spadix quoted; all figures from the No. 3040 in the Calcutta Herbarium.

12. CALAMUS BURCKIANUS Becc. in Rec. Bot. Surv. Ind. ii, 198.

DESCRIPTION.—Probably bushy (not scandent). *Stem* and *leaf-sheaths* not seen. *Leaves* (including a portion of the unarmed terete-subcompressed petiole measuring 25 cm.) a metre in length; rachis glabrous, trigonous, convex below where smooth (or sometimes armed with small rudimentary claws?), the margins and the superior angle acute; leaflets thinly papyraceous, numerous, alternate, regularly equidistant (10–12 mm. apart), linear-ensiform, somewhat attenuate towards the base, subulately acuminate at the apex, green on both surfaces when dry, the lower surface slightly paler; upper surface distinctly 3-costate, the mid-costa acute, prominent and bearing on its apical half some dark bristles, the side costæ bristly along their whole length; lower surface with nerves indistinct and only the mid-costa sparingly bristly, or sometimes smooth or one nerve on each side bristly; the margins with a few distant adpressed spinules, more numerous towards the apex, the lower somewhat thickened by an intramarginal nerve; transverse veinlets rather distant and indistinct, sinuous and much interrupted; the largest leaflets, the lowest, 28–30 cm. long and 12–13 mm. broad, the others gradually decreasing in size upwards, the two apical (the smallest) 12 cm. by 6–7 mm., slightly connate at the base. *Male spadix* . . . . . *Female spadix* not seen entire; the few partial inflorescences seen 50 cm. long, ending in a caudate, rigid, unarmed appendix, a few cm. long, bearing on each side few (4–7), alternate, distichous, erecto-patent spikelets; primary spathes not seen; secondary spathes tubular-infundibuliform, unarmed, closely sheathing, 3–4 cm. long, the mouth obliquely truncate and naked, but at one side prolonged into a triangular, acute, erect point; spikelets attached to the bottom of their own spathe by a slender 2–3 cm. long pedicellar part, vermicular, rather thick and rigid, flexuose, 12–15 cm. long, with 10–15 distichous, rather distant (1 cm. apart) flowers on each side; spathels shortly tubular-infundibuliform, usually split in the fruiting stage, the mouth horizontally truncate and naked, apiculate on one side; involucrophorum distinctly pedicellate, arising from the bottom of its own spathel, obliquely truncate, sharply two-keeled next to the axis, where not adnate; involucre cupular, slightly longer than the involucrophorum, truncate and obscurely 3-toothed; areola of neuter flower lunate. *Fruiting perianth* explanate (not pedicelliform); calyx not callous at the base, split almost to the base into 3 ovate, acute segments; corolla with three segments almost as long as those of the calyx, but narrower and more acute. *Fruit*, when not quite ripe, globose and 9–10 mm. in diam., suddenly apiculate, its scales in 24 longitudinal series, brownish, rather dull, slightly channelled along the middle, small (1–5 mm. broad), their apices obtuse;

their margins pale, very finely and minutely erosely ciliate. *Seeds* (immature) usually 3, with smooth surface, convex back and two flat ventral facets, occasionally one or two of the seeds tending to abort.

HABITAT.—Java (*Kurz* in Herb. Munich and *Teysmmann* in Herb. St. Petersb.)—Javanese name "Hooy buluk-buk"—*vide* Blume, Rumphia iii, 30.

OBSERVATIONS.—I have seen of this only one leaf, apparently a radical one and deprived of its sheath, and some portion of a spadix bearing not quite ripe fruits; these specimens were sent to the St. Petersburg Herbarium by Teysmann. Another more incomplete specimen, perfectly like the preceding, is preserved in the Herbarium at Munich, sent there by Kurz. On these specimens alone is based the description above, but I consider as conspecific with the specimens mentioned another which I have received from the Leyden Herbarium. In this the spikelets are 8–12 cm. long, the fruit is perfectly globular or a trifle longer than broad (10–12 mm. in diam.), rounded at both ends, but surmounted by a very short beak; the scales are in 23 rows and have a very narrow intramarginal line. In all the ripe fruits which I have examined I have found only a single seed fully developed; of the other two seeds only inconspicuous traces were found. The seed has an even, dark, opaque, not alveolated nor pitted surface, is orbicular, somewhat depressed, 9–9·5 mm. in diameter, somewhat concave on the raphal side and with a shallow chalazal fovea; the albumen is equable and the embryo is situated near the base of its ventral and convex face. A leaf in the Leyden Herbarium, labelled "Java: Hooy belock-buk, Hasskarl," apparently belongs to the fruiting spadix just described, but is armed on the back along the middle of its rachis with a few small short solitary and remote claws.

PLATE 18.— Calamus Burckianus *Becc.* Partial inflorescence with unripe fruits and apex of a leaf seen from the upper surface with a small portion at its base seen from the lower; these parts are from Teysmann's specimen in the St. Petersburg Herbarium. The spikelet with mature fruits, the seeds and the portion of leaf on the left-hand side are from the specimens in the Leyden Herbarium described in the observations.

13. CALAMUS DEERRATUS Mann & Wendl. in Trans. Linn. Soc. xxiv, 429, t. xl, F; H. Wendl. in Kerch. Les Palm. 236; Drude in Bot. Jahrb. xxi. iii; Becc. in Rec. Bot. Surv. Ind. ii, 199; Wright in Fl. Trop. Afri. viii, 109 (partly).

DESCRIPTION.—Scandent, rather slender, or of moderate size, 5–10 metres long. *Sheathed stem* 18–25 mm. in diam. *Leaf-sheaths* rather thickly coriaceous, more or less partially fugaciously scaly-furfuraceous, gibbous above, rather densely armed with brown, rigid, flat, very thin, lanceolate, subulate spines which arise from a broad but not tumescent base and are often divided or laciniate or with the margins deeply cleft, spreading or slightly deflexed, solitary or aggregated in small series; the spines are more abundant, longer (as much as 2 cm. long) and more distinctly seriate on the ventral side of the upper portion of the sheaths, where from a horizontal position they gradually become erect near the base of the petiole. *Ocrea* very conspicuous, produced laterally at the base of the petiole into two papyraceous or dry membranous, ultimately lacerated auricles, which are 4–5 cm. long and entirely covered with some spines similar to those of the sheaths, mixed with others which are more slender or bristle-like. *Leaves* rather large, the one seen entire 1 metre in length, not cirriferous; petiole very short (5–6 cm.), rather robust, flattish above and armed at the margins with some straight, needle-like, ascending spines, 1–2 cm. long, rounded beneath where more or less armed, at east along the middle, with some straight spines passing into claws; rachis flat above in the first portion and channelled laterally where the leaflets are attached, acutely bifaced above and trigonous in cross-section upwards, rounded near the base and flat upwards beneath, where armed throughout along the middle and occasionally at the sides with dark-tipped solitary claws; leaflets rather numerous, subequidistant 2–3 cm. apart (aggregated in young plants, according to Mann and Wendland), rigidulous, papyraceous, linear-lanceolate, or lanceolate-ensiform, attenuated towards the base, where deeply plicate, gradually acuminate into a subulate and caudate spinulous tip, glabrous and subshining above, rather distinctly paler beneath, where dotted or more or less sprinkled with brown scales, and under the lens finely striate; mid-costa acute and prominent above, accompanied on each side by 2–3 secondary nerves, of which one is a little stronger than the others, but not so much so as to render the surface distinctly 3-costate; all the nerves in the upper surface smooth, or sometimes the mid-costa spinulous (as exceptionally and very sparingly are the side–nerves); on the under surface the mid-costa and 2–3 slender nerves on each side of it occasionally are furnished with few, small, short, spreading, spinulous bristles, which rest on a sub-bulbous base; oftener, however, the bristles are closer and stronger along 3 of the 5 nerves, but chiefly on the mid-costa, while on the side ones they are small, very scarce or wanting; margins slightly thickened by a weak secondary nerve and rather densely aculeolate-serrate; transverse veinlets slender, very interrupted; the largest leaflets, those a little above the base, 35–38 cm. long and 1·5–3 cm. broad; the upper rather abruptly shorter, but not narrower, and with a less acuminate tip, which is indented or notched on the lower margin, but in a lesser degree than in the basal ones; the two of the apical pair 15–16 cm. long and almost entirely free at the base. *Male* and *Female spadices* simply decompound, elongate, flagelliform, 70–80 cm. long with very few partial inflorescences (1–3) and besides lengthened out into a clawed flagellum of equal length; primary spathes very narrow, tubular, elongate, closely sheathing; the lowest usually split longitudinally (as the upper ones), somewhat flattened, with not very acute and smooth or slightly spinous edges; the upper cylindraceous, unarmed or nearly so, obliquely truncate at the mouth and produced at one side into a short triangular point; male partial inflorescences 15-20 cm. long, attached inside their respective spathes with a rather elongate peduncular portion and furnished with 7–9 distichous approximate spikelets on each side; secondary spathes tubular-infundibuliform, unarmed, obliquely truncate and ciliate at the mouth, produced at one side into a short point; spikelets inserted just below the mouth of their own spathe and not callous at their axilla, 4–5 cm. long, bearing 8–12 distichous flowers on each side, the upper spikelets shorter and with fewer flowers; spathels very crowded, brown, strongly striately-veined, obliquely and very broadly infundibuliform, extended at one side into an acute triangular point;

involucre subdimidiately cupular, very obliquely cut off posticously, lunately emarginate, and acutely 2-keeled, attenuated at the base and attached to the bottom of its own spathel. *Male flowers* 5 mm. long, ovoid-oblong; calyx ovoid, submembranaceous, strongly striately veined, rather deeply divided into 3 acute lobes; corolla one-half longer than the calyx, divided down almost to the base into 3 oblong, acute, striate segments; stamens all of the same length, the filaments subulate, inflexed at the apex and shortly united at their base; anthers lanceolate, acute, with deeply separated cells; rudimentary ovary rather conspicuous, formed by 3 subulate bodies which are united by their bases and are nearly as long as the filaments. *Female spadix* very similar to the male; spikelets with spathels a little larger than in the male spadix; involucrophorum obliquely cupular, truncate, posticously 2-keeled, inserted at the bottom of its own spathel and entirely included in this; involucre irregularly cupular with the margin often split or lobate; areola of the neuter flower large and deep, sometimes subcupuliform, occasionally with a fully developed flower and therefore with two nearly equally developed flowers in one spathe. *Female flowers* ovoid, about the same size as the males; calyx ovate, thinly coriaceous, striately veined, acutely 3-toothed at first, ultimately split down to the base; corolla a little longer than the calyx, divided almost to the base into 3 ovate-lanceolate acute segments; filaments of the stamens united at the base into a not very high ring and in the free part elongately triangular with sterile sagittate anthers; ovary oblong, tapering towards the base, crowned by 3 thick, trigonous, acute stigmas which are strongly lamellose inside. *Fruiting perianth* split and explanate under the fruit. *Fruit* ovoid, 15–17 mm. long, 10 mm. in diam., rounded at the base, conically narrowing at the apex, crowned by the bases of the stigmas; scales in 21 series, rather shining, somewhat convex, very faintly channelled along the middle, yellowish-brown, with a broad, brown-chestnut, intramarginal line; margins and tip broadly scarious, beautifully and finely fimbriate. *Seed* oblong, slightly compressed, rounded at the base, apiculate at the apex, 1 cm. long, 7 mm. thick, rugose or wrinkled on the back, with a shallow, elongate, chalazal fovea in the centre of the raphal face, from which irradiate a few superficial ridges; albumen equable; embryo in the centre of the base.

HABITAT.—West Tropical Africa: on the rivers Bagroo and Cameroons (*G. Mann* Nos. 891 and 2147 in Herb. Kew).

OBSERVATIONS.—From the accurate study of this species I am able to state that no remarkable character separates the African from the Asiatic *Calami; C. deerratus* is indeed strikingly related to some of the Asiatic species of the fifth group.

The involucre of the male flowers and the involucrophorum of the female ones are attached to the bottom of their own spathel by means of a very small basilar point, and are consequently almost stalked and not laterally adnate to the base of the spathel above its own, but are completely free from it. This, however, is not a character peculiar to the African *Calami*, but it is one which they have in common with some Asiatic species (*C. Zollingerii, castaneus, Griffithianus*, etc.); in these, however, when the involucre of the flowers have such a structure, the spikelets are stalked by a peduncular portion arising from the bottom of their respective spathes. In *C. deerratus*, on the contrary, the spikelets, though issuing from inside, are attached very near the mouth of their own spathe. No leaf-sheath flagella were present in the specimens I have seen, but very probably the plant is furnished with them in its upper part when not bearing spadices.

In the specimens from the Cameroon River (*Mann* No. 2147) all the nerves ni the upper surface of the leaves are smooth; in those from the Bagroo River (No. 891) the mid-costa is spinulous, and exceptionally a few spinules are to be seen on the secondary nerves.

A male spadix from Cameroon is 1·35 m. long, and bears only one partial inflorescence issuing from the lowest spathe, the remaining portion forming the flagellum. Another male spadix from Bagroo has three inflorescences. Rather frequently two flowers of equal size, and probably both fertile, come out from one spathel; when this is the case, each flower is sometimes furnished with its own involucre, but more frequently there is a normal cupular involucre accompanied by a smaller one at its side.

PLATE 19.—Calamus deerratus *Mann & Wendl.* Leaf-sheath with the base of a leaf and a male spadix from a young plant; spadix with mature fruits; apex of a leaf-sheath from a full-grown plant (in the upper right-hand corner). All the figures from Mann's specimens in the Herbarium at Kew.

14. **CALAMUS BARTERII** Becc. in Herb. Kew.; Drude in Engl. Bot. Jahrb. xxi, 134 (partly); Becc. in Rec. Bot. Surv. Ind. ii, 199; Wright in Fl. Trop. Afr. viii, 109 (partly).

DESCRIPTION.—Scandent, slender. *Sheathed stem* as thick as a man's finger, 10–15 metres long (Barter). *Leaf-sheaths* flagelliferous, thinly coriaceous, scaly furfuraceous (fugaciously ?), longitudinally striated, unarmed, very slightly gibbous above. *Ocrea* conspicuous, liguliform, 12–15 mm. long, shortly bilobed, split on the outer side, where, as at the apex and in a lesser degree at the margins, bristly-spinulous. *Leaf-sheath flagella* slender, filiform, terete, about 60 cm. long, armed with small solitary or sub-aggregate claws. *Leaves* not cirriferous, 45-50 cm. long; petiole 6–8 cm. in length, very obsoletely trigonous, channelled above, armed at the margins with some patent, straight, relatively robust spines of variable length, and beneath along the middle with solitary small claws, which appear at distant intervals throughout the entire length of the rachis; rachis partially furfuraceous, slender, trigonous, bifaced with acute and smooth angle above; leaflets few, 9–10 on each side, grouped in rather distant opposite fascicles of two to four on each side, very spreading and sometimes nearly horizontal; sometimes single leaflets have the corresponding one on the opposite side or remain solitary; four slightly shorter than the others are grouped at the apex, and the two of the terminal pair are completely free at the base; they are all linear-lanceolate, narrowed at the base and very gradually acuminate into a long, filiform, bristly-ciliate tip, dull-green (when dry) above, slightly paler beneath, where somewhat rusty-furfuraceous near their insertion, but otherwise glabrous, not or very sparingly sprinkled with brown scaly dots, thinly papyraceous and rather flaccid, subherbaceous; the mid-costa in the upper surface not very strong, acute and smooth; the side-nerves slender and also smooth; on the under surface the mid-costa and one nerve on each side of it furnished with some very small spinules; transverse veinlets rather remote and much interrupted; margins very closely spinulous with a slender nerve running along them; the largest leaflets, those near the base, 15–18 cm. long, by 10–13 mm. in breadth. Other parts unknown.

HABITAT.—West tropical Africa at Onitscha on the River Niger (*Barter* No. 110 in Herb. Kew).

OBSERVATIONS.—Of this species I have seen the upper portion of a sterile plant with the sheathed stem 6 mm. in diam. Amongst the African *Calami*, this seems well defined by the well-marked clustered arrangement of the leaflets. Judging from the general structure of the leaf-sheath flagella, which are morphologically sterile spadices, we may suppose that the spadices in *C. Barterii* ought to be very like those of *C. deerratus*, but this is a much larger plant with strongly armed sheaths and numerous subequidistant leaflets. I have considered as a new species (vide *C. falabensis*) the specimens described by Drude (l. c.) as the male plant of *C. Barterii*. The canes are much employed in the lower part of the River Niger for tying. The fruit is said to be small and dark brown when ripe (Barter).

PLATE 20.—Calamus Barterii *Becc.* The entire Barter's specimen No. 110 in the Herbarium at Kew.

15. CALAMUS HEUDELOTII Becc. in Herb. Kew.; Drude in Engl. Bot. Jahrb. xxi, (1896), pp. 112 and 134; Becc. in Rec. Bot. Surv. Ind. ii, 199 Wright in Fl. Trop. Afr. viii, 109.

DESCRIPTION.—Slender, not very high, scandent (2–3 m., Heudelot). *Sheathed stem* about 1 cm. in diam. *Leaf-sheaths* flagelliferous, partially and fugaciously furfuraceous greenish even when dry, longitudinally striate, slightly gibbous above, armed with scattered, solitary, very small, horizontal, semiconical spines. *Leaf-sheath flagella* filiform, slender, about 1 m. long, their lowest spathe flattened, scantily aculeate on the sharp edges; the succeeding spathes cylindraceous, more or less clawed; the apical portion nearly terete, armed with 2–3-nate claws. *Ocrea* conspicuous, externally produced into a ligule which is 2 cm. long, obliquely cut like the mouth of a beaked flute, entire, with smooth margins and singularly ornamented externally with closely seriated laminar, lacerated or comb-like, 4–5 mm. long spines. *Leaves* (not seen entire) about 60–70 cm. long, not cirriferous; petiole short (7–8 cm. long), flattish on its upper face, acute at the sides, where armed with some straight horizontal spines which become hooked upwards (as in the first portion of the rachis), rounded on the lower face near the base, and armed there along the middle with a few strong, rather long (10–12 mm.), solitary, straight, somewhat deflexed, black-tipped spines, which rest on a large swollen base and gradually decrease in length and are transformed into claws along the rachis; the rachis is flat and deeply channelled laterally (where are inserted the leaflets) in its first portion, and upwards is bifaced with an acute naked angle above; leaflets not very numerous, perhaps 18–20 on each side, very patent and sometimes horizontal in fully developed leaves, more or less irregularly grouped in fascicles of 2–3, occasionally 4, on each side, the fascicles of one side opposite or alternate with those of the other side and with short or long vacant spaces among them; in some the rather long portions are sometimes nearly equidistant; they are all linear, lanceolate or lanceolate-ensiform, narrowed at the base and subulately acuminate into a hairy ciliolate tip, papyraceous, rather rigid, subshining, of about the same colour on both surfaces, but a little paler beneath, where they are glabrous, not scaly or dotted and with all the nerves faint and naked or with a few very small spinules along the mid-costa; the upper surface indistinctly 3-costulate, or 1-costate with 1–2 slender nerves on each side of the mid-costa, which is rather acute and spinulous above; the side-nerves naked or sometimes very sparingly spinulous; the transverse veinlets much interrupted and rather distant; the margins slightly thickened by a fine nerve and finely spinulous-serrate; the largest leaflets, those a little above the base, 25–28 cm. long by 12–16 mm. in breadth; the two extreme ones much smaller and quite free at the base. *Male spadix* not seen. *Female spadix* (not seen entire)—its axial unsheathed part very slender—strongly armed with very sharp, solitary or aggregate black-tipped claws which rest on a swollen light base; primary spathes tubular, elongate, closely sheathing, the lowest flattened aculeolate at the sides; partial inflorescences short (15–17 cm. long), rising erect and then arched downwards, not callous at the axilla, with 5–7 spikelets on each side, secondary spathes elongate-infundibuliform, smooth, obliquely truncate at the mouth and produced on one side into a triangular, acute, patent point; spikelets inserted just at the mouth of their own spathe, slightly callous at their axilla, arched and strongly recurved, short, subcylindraceous, 2–4 cm. long, bearing 3–7 flowers on each side; spathels infundibuliform, narrowed at the base, smooth, truncate at the mouth; involucrophorum cupular, very obliquely truncate, narrowing to the base and attached at the bottom of its own spathe where it is almost entirely enclosed, very acutely 2-keeled on the side next to the axis; involucre obliquely cupular, entire, rather deep; areola of the neuter flower concave, ovate, sharply defined. *Fruiting perianth* not pedicelliform, but explanate under the fruit. *Female flowers* about 4 mm. long; the calyx striately veined, 3-toothed, ultimately entirely split; the corolla one-third longer than the calyx, divided down into three narrowly ovate, nearly obtuse segments, smooth outside; the stamens with filaments connate by their bases, elongate-triangular in the free part, anthers linear. *Fruit* ovoid, roundish at the base and gradually narrowing upwards into a conical beak, about 15 mm. long, 9 mm. thick; scales in 15–16 series, channelled along the middle, shiny, yellowish-brown with a darker rusty-reddish intramarginal line, rather acute tip and erosely-toothed scarious margins. *Seed* elongately-ovoid, about 9 mm. long, with an almost smooth surface and a not very deep chalazal fovea in the centre of the raphal face; albumen equable; embryo basal.

HABITAT.—Senegambia: abundant on the Islands Cayaye and Souloubolon of the River Gambia (*Heudelot* No. 372 in Herb. Webb, Kew and Delessert); River Gambia (*Ingram* in Herb. Kew.).

OBSERVATIONS.—According to a note (the copy of Heudelot's original one?) accompanying a specimen in Webb's Herbarium at Florence, this is a plant not surpassing 2–3 m. in height. This specimen consists of the upper part of a leaf and of a small portion of a female spadix with only one partial inflorescence charged with nearly mature fruits. Ingram's specimen is sterile and consists of the upper leafy portion of a stem.

The description of the leaf-sheath and of the ocrea is from a sterile specimen in the Herbarium at Kew, collected like those of Heudelot on the banks of the River Gambia. Heudelot's original note, with the date of 1836 annexed to his No. 372 in Delessert's Herbarium, says that it is "a palm 2–3 m. high with reclining stems which are 3–4 cm. in diam. and furnished as well as the leaves with hooked spines. It was in flower and had fruit in March. Found on the Islands Cayaye and Souloubolon, where it grows in such abundance on the banks of the river (Gambia) as to render it very difficult to penetrate into the interior of those islands."

Heudelot's specimens are all very fragmentary, consisting of portions of the leaves and detached partial inflorescences with almost ripe fruit.

PLATE 21.—Calamus Heudelotii *Becc.* The upper portion of a young plant (on the left side) from Ingram's specimen in Herb. Kew; apex of a leaf and partial inflorescences with mature fruit from Heudelot's No. 372 in Herb. Webb at Florence.

16. CALAMUS FALABENSIS Becc. sp. n.

DESCRIPTION.—Scandent and apparently slender. *Leaf-sheaths* . . . . . *Leaves* not cirriferous; petiole . . . .; rachis in the upper portion flattish beneath, where armed with remote, small, black-tipped claws; leaflets inequidistant, inserted at a rather acute angle, some of them no more than 2 cm. apart with vacant spaces 4–7 cm. long, papyraceous, rather rigid, dull-green, slightly paler beneath, very narrowly lanceolate, somewhat narrowed to the base and from the lower third part upwards gradually acuminate into a very fine point, bristly spinulous at the sides, unicostate or sometimes sub-tricostulate; the mid-costa rather slender, furnished with a few bristly brown rather distinct spinules on both surfaces; the secondary nerves are two on each side of the mid-costa, with an additional one on each margin—all are naked above and one on each side of the mid-costa is spinulous-bristly beneath; transverse veinlets fine, not very crowded and much interrupted; the largest leaflets (the lowest of the small portion of the leaf seen by me) 20 cm. long and 18–20 mm. in breadth; the upper rather suddenly shorter, the two terminal very narrow, free at the base. *Male spadix* elongate-flagelliform (not seen entire); the basilar axial portions between two partial inflorescences narrow and armed on the back with more or less aggregate claws; upper primary spathes very narrow, very long, tubular-cylindraceous, very closely sheathing, almost polished, but striate laterally, obliquely truncate at the mouth and extended at one side at the apex into a triangular point; partial inflorescences inserted above the mouth of their own spathe, not callous at their axilla, arising at first erect next to the axis, then nodding, in one specimen 35 cm. long with 12–13 spikelets on each side and ending in a cylindraceous tail-like appendix—about 4 cm. long, sheathed with unarmed spathes; secondary spathes tubular-infundibuliform, narrowed to the base, unarmed, finely striately veined, entire and obliquely truncate at the mouth, prolonged at one side into a rather elongate triangular point; spikelets attached near, but inside the mouth of their own spathe, not callous at the axilla, somewhat arched and flexuose, spreading or recurved, flattish, 8–10 cm. long (the uppermost slightly shorter than the lower ones) with 19–20 flowers on each side; spathels infundibuliform, narrowed a good deal at the base, rather approximate and with the base of the one partly included in the one below, not very distinctly striately veined, entire at the mouth and extended at one side into a very acute and patent point; involucre cupular, rather deep, almost totally concealed in its own spathel, very obliquely truncate externally, very acutely two-keeled and almost two-winged, bi-dentate and deeply emarginate on the side next to the axis. *Male flowers* perfectly bifarious, inserted at a rather acute angle and half concealed by their respective spathels, elongate, very slightly falcate, very acute; the calyx tubular-cylindraceous, slightly striately veined, with three short acute triangular teeth; the corolla one-third longer than the calyx with acute segments, polished externally.—Other parts unknown.

HABITAT.—Sierra Leone: in swampy places near small streams on the laterite plateau of Falaba (*Scott Elliot* No. 4460 in Herb. Berol).

OBSERVATIONS.—Of this species I have seen only a specimen of one partial inflorescence and the upper portion (35 cm. in length) of a leaf. This same specimen was regarded by Prof. O. Drude (l. c.) as belonging to *C. Barterii*, from which however it differs in the different arrangement of the leaflets, which in *C. Barterii* are, as in the Asiatic *C. gracilis*, distinctly clustered into a few patent spreading groups, and besides are thin and almost herbaceous in texture. In *C. falabensis* the leaflets are simply inequidistant, rigid and firm in texture, and inserted at a rather acute angle. *C. Heudelotii* seems to me a nearer ally to *C. falabensis* than *C. Barterii*, but of *C. Heudelotii* the female plant only is known, while we have only the male of *falabensis*, and consequently it is difficult to make an exact comparison of the two; but in *C. Heudelotii* the leaflets have the nerves naked beneath and only the mid-costa is spinulous, while in *C. falabensis* 3 nerves are spinulous beneath. It differs from *C. Leprieurii*, of which the male spadix much resembles that of *C. falabensis*, in the falcate male flowers and in the more rigid and more inequidistant leaflets.

PLATE 22.—Calamus falabensis *Becc.* Partial inflorescence and apex of the leaf of the type-specimen in the Herbarium at Berlin.

17. CALAMUS LEPRIEURII Becc. in Rec. Bot. Surv. Ind. ii, 200.

DESCRIPTION.—Very probably scandent and not of large size. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* short, 35–40 cm. long, not cirriferous; petiole 7–10 cm. long, rather thick, subcylindric and longitudinally wrinkled (when dry), more or less covered with greyish, removable, furfuraceous scurf, armed beneath and at the sides with some strong, straight, horizontal, dark-tipped spines; rachis more or less furfuraceous as is the petiole, rigid, and relatively thick, acutely bifaced above, roundish beneath, where armed along the middle with solitary, straight, horizontal or slightly deflexed spines, which change into small claws towards the apex; leaflets rather many and crowded, inserted at an angle of about 45°, more or less inequidistant or interruptedly equidistant, being sometimes, mainly near the apex, divided by short vacant spaces into 2–3 groups, where each leaflet is regularly about 15 mm. apart; furthermore the leaflets are papyraceous, narrowly lanceolate, somewhat attenuate to the base, gradually subulately acuminate at the apex, opaque, slightly paler beneath than above, their mid-costa sparingly spinulous on both surfaces or smooth beneath; the secondary nerves slender and naked; the transverse veinlets sharp, much interrupted; the margins rather closely spinulous, not or very slightly thickened by a marginal nerve; the largest 15–17 cm. long, 15 mm. broad, the upper ones shorter; the two of the terminal pair quite free at the base. *Male spadix* flagelliform, very elongate, simply decompound, the one seen (wanting the base) 1 m. long and in addition produced into a rather long finely clawed flagellum; primary spathes very narrow-tubular, cylindraceous or somewhat flattened, strictly sheathing, chartaceous, sparsely aculeolate, obliquely truncate at the mouth and produced at one side into a triangular acute point; partial inflorescences terminating in a caudate sheathed unarmed appendix, in the spadix seen by me 5 in number, of which the largest, the lowest, is 30 cm. long with 7–8 spikelets on each side, the others shorter and with fewer spikelets; secondary spathes elongate-infundibuliform, unarmed, finely striately veined, obliquely truncate and naked at the mouth and produced at one side into a broad triangular acute point; spikelets attached a little below the mouth of their own spathe, narrower at the base than above (with the spathels there very closely imbricate, flowerless and smaller than higher up), flattened, arched, spreading, the largest 6 cm. long with about 12 flowers on each side, which are erecto-patent and half immersed in their own spathels; spathels very asymmetrically infundibuliform, subspathaceous, entire, truncate and naked at the mouth; finely striately veined, produced at one side into a rather acute tip; involucre dimidiately cupular or shaped like a swallow's nest, anticously truncate, posticously deeply lunately emarginate, acutely two-keeled and bi-dentate next to the axis. *Male flowers* narrowly ovate, obtuse, slightly curved or asymmetric; the calyx striately-veined, with 3 broad lobes; the corolla one-third longer than the calyx—its segments polished externally, apiculate or almost obtuse. *Female spadix* elongate with rather many remote (about 40 cm. apart) partial inflorescences; primary spathes as in the male spadix, the lowest about 25 cm. long, split longitudinally on the ventral side and acutely bicarinate on the back, the carinæ armed with small remote ascendent spines; axial portions of the spadix (between two partial inflorescences) concave on the inner side at their base and convex and sparingly clawed dorsally; partial inflorescences very elongate, 30–50 cm. long, terminated by a short, filiform, unarmed, tail-like appendix, the largest with 12 spikelets on each side; secondary spathes elongate-infundibuliform, unarmed and almost polished, truncate at the mouth and extended on one side into a broadly triangular and rather acuminate point; spikelets inserted a little inside the mouth of their respective spathes, rather thick, arched and recurved, the largest, the lowest, 10–20 cm. long with 10–18 flowers on each side, the upper ones gradually decreasing in length and number of flowers, the uppermost half the length of the lower ones; spathels infundibuliform, unarmed, indistinctly striately veined, truncate and entire at the mouth and prolonged at one side into a short triangular ultimately withered spreading point; involucrophorum inserted at the bottom of its own spathel, subspathaceous or obliquely cupular, acutely bicarinate, bi-dentate and emarginate on the side next to the axis, almost entirely enclosed in its own spathel; involucre unilaterally cupular, rather deep, entire, with the areola of the sterile flower ovate, sharply defined. *Female flowers* about 5 mm. long, ovate. *Fruiting perianth* not pedicelliform, split down to the base into 6 equal lanceolate strongly striated lobes (3 of the calyx and 3 of the corolla). *Fruit* (immature) ovate, conically narrowed at the apex; scales in 18 series, yellowish near the base and with a broad intramarginal sharply defined band and a scarious brown fimbriate-denticulate margin. *Seed* . . . . . —The spikelets and flowers acquire in drying a chocolate-brown colour.

HABITAT.—West Tropical Africa: Senegambia, *Leprieur.*

OBSERVATIONS.—Of this species, which has remained more than 70 years unnamed in Herbaria and has not been found again by modern travellers, I have seen in the Paris Herbarium a specimen of a male spadix, accompanied by two entire leaves, labelled: "Senegambia—M. Leprieur, 1830—Herbier d'Adrien de Jussieu, donné au Muséum par ses enfants en 1857," and another specimen, apparently of the same gathering and with immature fruit, in Delessert's Herbarium at Geneva. A third specimen, consisting of two partial female inflorescences and one leaf, is preserved in the Leyden Herbarium and was also gathered by Leprieur in Senegal. The leaflets of the female specimen in the Leyden Herbarium have a small and short but relatively strong spinule at their base on the upper side next to the rachis. This spinule is scarcely visible in the two leaves of the Paris specimens, which leaves are respectively 35 and 40 cm. long and are very similar to that of the above-mentioned Leyden specimen, but in one the leaflets are distinctly grouped, while in the other they are almost equidistant and with short vacant spaces only near the apex of the leaf. The mid-costa is sparingly spinulous above and quite smooth beneath in both.

PLATE 23.—Calamus Leprieurii *Becc.* An entire leaf (undersurface); male spadix apparently almost entire. From Leprieur's specimen in the Paris Herbarium.

PLATE 24.—Calamus Leprieurii *Becc.* Leaf and portion of a female spadix with very young fruit. From Leprieur's specimen in the Leyden Herbarium.

18. CALAMUS PERROTTETII Becc. in Rec. Bot. Surv. Ind. ii, 200.

DESCRIPTION.—Slender, scandent. *Leaf-sheaths* armed with scattered laminar rather small, 8–10 mm. long, black-tipped spines. *Ocrea* rather elongate, furfuraceous, horizontally truncate, very sparingly spinulous at the base and not on the outer side. *Leaves* (in one specimen) 60 cm. long, not cirriferous; petiole rather long (18 cm.), rather thick, subcylindric and wrinkled longitudinally when dry; armed irregularly all round with some straight, horizontal, rather strong, 1 cm. long, dark-tipped spines; rachis more or less fugaciously furfuraceous as is the petiole, rigid and relatively thick, acutely bifaced and smooth above, roundish beneath, where armed along the middle with solitary, straight, horizontal or slightly deflexed spines, which change into small claws towards the apex; leaflets rather many and crowded, inserted at an angle of about 45°, interruptedly equidistant, viz. divided in groups by short vacant spaces, but equidistant in each group, papyraceous, linear-lanceolate, somewhat attenuate towards the base, gradually subulately acuminate to the apex, opaque, slightly paler beneath than above, their mid-costa acute and sparingly spinulous above or smooth on both surfaces; the secondary nerves slender and naked; the transverse veinlets sharp, much interrupted; margins rather closely spinulous; the largest leaflets, those a little above the base, 18–20 cm. long, 12–14 mm. broad, the uppermost shorter, the two of the terminal pair free at the base. *Male spadix* . . . . . *Female spadix* apparently as in *C. Leprieurii*; primary spathes . . . . . ; partial inflorescences elongate, with many distichous spikelets on each side and terminating in a short, sheathed, unarmed, tail-like appendix; secondary spathes elongate-infundibuliform, unarmed, finely striately veined, entire and obliquely truncate at the mouth and extended at one side into a broadly triangular, acute point; spikelets inserted just at the mouth of their respective spathes with a rather distinct axillary callus, rather thick, arched and recurved, the largest (the lowest in a portion of an inflorescence) 7 cm. long, with 10 pairs of female flowers on each side (as it seems that each spathel subtends two equally well-formed female flowers); the uppermost spikelets half the length of the lower ones; spathels approximate, broadly infundibuliform with a very narrow base, striately veined, extended at one side into a broadly triangular, acute or acuminate, erect, amplectent point; involucrophorum almost entirely immersed in its own spathel and attached at the base of the one above, sub-spathaceous, enveloping the neuter flower, acutely bi-carinate, bi-dentate and deeply emarginate on the side next to the axis; involucre deep, cupular, unilaterally evolute, sub-auriculiform, immersed in the involucrophorum; areola of the neuter flower very conspicuous, ovate, concave, with raised and often winged borders. *Female flowers* ovate, 5 mm. long; the calyx striately veined, cleft into 3 concave, ovate, acute parts; the segments of the corolla concave, acute, ovate-lanceolate, opaque, striately veined externally, slightly longer than the calyx. *Neuter* flower apparently not differing from the female one, which is in the usual position.

HABITAT.—Senegal: at the mouth of the River Casamance.

OBSERVATIONS.—In the year 1902 I had given the name of *C. Perrottetii* to a *Calamus* preserved in the Herbarium Delessert at Geneva and collected by Perrottet (No. 761) in the damp forests of the west coast of tropical Africa on the 10th of April 1829, near the village Sedhiou on the river Casamance in Senegal. Later I have received another specimen of this same species from Dr. Schweinfurth and collected by Leprieur in 1826, also on the river Casamance near the village of Montsor at Cape Rosso. This last specimen consisted of the apex of a stem with a portion of the leaf-sheath and an entire leaf, and of the apex of a partial inflorescence 20 cm. in length with 6 spikelets on each side. This is the specimen I have described. *C. Perrottetii* is extremely like *C. Leprieurii*, but its spikelets have a peculiar facies on account of the large, broadly infundibuliform, spathaceous spathels which embrace the flowers; the leaflets have not at their base the spinules so often seen in *C. Leprieurii* and are more elongate than in this last. In *C. Leprieurii* the companion neuter flower at each spathel is always sterile, whilst in *C. Perrottetii* the two flowers during anthesis seem perfectly alike, but I have seen no spikelets after fertilisation. Nevertheless *C. Perrottetii* must be considered as a rather doubtful species, and must be compared again with *C. Leprieurii* when more complete materials have come to hand.

PLATE 25.—Calamus Perrottetii *Becc.* The entire Perrottet's type-specimen in Herb. Schweinfurth.

19. CALAMUS AKIMENSIS Becc. sp. n.

DESCRIPTION.—Apparently scandent. *Stem* . . . . . . *Leaf-sheaths* . . . . . *Leaves* . . . . . *Female spadix:* partial inflorescences rather large, in one specimen 50 cm. in length, elongate-pyramidal in outline, with 15 gradually shortening spikelets on each side; secondary spathes infundibuliform, usually split longitudinally in their upper part and prolonged at one side into a rather elongate-triangular acuminate point; spikelets thick, vermicular, inserted near the mouth, but inside their own spathe; the lower ones, the largest, 15 cm. long with about 25 flowers on each side, slightly sinuous; the upper ones gradually shorter and with fewer flowers, strongly arched; those near the apex 7–8 cm. long with 7–8 flowers only on each side; spathels finely striately veined, very broadly and obliquely infundibuliform, extended at one side into a broad triangular point; involucrophorum cupular, bi-dentate and acutely two-keeled on the side next to the axis, inserted at the bottom of its own spathel and entirely included in this; involucre entire, subauriculiform or obliquely cupular, viz. more elongate on the side of the neuter flower of which the areola is very distinct, vertically elongate and with a very acute margin. *Female flowers* about 5 mm. long. *Fruiting perianth* split and explanate under the fruit; the segments of the corolla lanceolate, acuminate, about as long as the lobes of the calyx and slightly narrower than these. *Fruit* conically ovoid from a round base or gradually tapering towards the apex into a conic and rather thick beak, about 2 cm. long and 1 cm. broad; scales in 15 series, shining, broadly and not deeply channelled along the middle, light-brown with a rusty-red irregularly fringed margin, and an acute point. *Seed* narrowly oblong, round at the base, somewhat apiculate at the apex, 11 mm. long, 6 mm. thick, coarsely, irregularly and superficially grooved on the surface, its chalazal fovea elongate on the centre of the raphal side; albumen equable; embryo basal.

HABITAT.—Discovered in December 1899 by *W. H. Johnson* at Kibbi in the Akim district of the Gold Coast (Herb. Kew).

OBSERVATIONS.—Of this species nothing is known beyond the partial inflorescence with mature fruit described above. Closely related to *C. deerratus*, but distinct by its larger partial inflorescences with numerous spikelers, which are also larger with broader or more spathaceous spathels. The fruit is longer or more gradually narrowed into a conic beak and with the scales in 15 series (in *C. deerratus* they are in 21) with the margins coarsely and irregularly (not very finely) fringed. By its subspathaceous spathels it resembles also *C. Perrottetii* a good deal.

PLATE 25A.—Calamus akimensis *Becc.* The entire type-specimen in Herb. Kew.

20. CALAMUS SCHWEINFURTHII Becc. in Rec. Bot. Surv. Ind. ii. 200.

C. secundiflorus (not of Beauv.) Schweinf. Beitr. Fl. Aethiopiens, 291; Drude in Engler's Bot. Jahrb. xxi. 131 (1896).

DESCRIPTION.—Scandent, slender. *Sheathed stem* 10–15 mm. in diam. *Leaf-sheaths* elongate, cylindrical, armed with small, scattered, solitary, deflexed, flat, laminar, subulate, blackish, shining spines, which rest on a small, tuberculiform, light base and are about 1 cm. in length. *Ocrea* liguliform, 2–3 cm. long, prolonged externally and obliquely cut like the mouth of a beaked flute, membranous, dry, bristly spinulous along the middle of the ventral face. *Leaves* not cirriferous, those of the upper part of the adult plant 1·2 m. in length including the petiole; this 25-30 cm. long and 6-7 mm. broad, finely longitudinally striate, flat and smooth above, the margins acute and feebly armed near their base with slender, straight, needle-like, black-tipped spines and upwards with a few small claws, rounded beneath; rachis remotely clawed beneath along the middle as is the petiole—the claws extending, solitary and rather small, to its apex; smooth, acute and bifaced above; leaflets rather numerous, about 20 on each side, inequidistant, usually 15–20 cm. apart, but sometimes interrupted by 2–3 longer vacant spaces, linear-ensiform, somewhat narrowing to the base, gradually attenuate towards the apex into a subulately acuminate spinulous-ciliolate point, thinly chartaceous, almost shining, about the same colour on both surfaces, but slightly paler beneath; the mid-costa acute, sparingly bristly-spinulous near its apex above, less prominent but more spinulous beneath; the side nerves all slender, one on each side of the mid-costa furnished on the upper surface with a few, rigid, dark, bristly spinules; on the under surface 2 and sometimes 4 secondary nerves more or less sprinkled (as is the mid-costa) with spinules shorter than those of the upper surface; transverse veinlets very distinct, much interrupted; margins minutely and closely spinulous; the bristles as well as the spinules on the nerves and on the margins have all a dark-brown point and a light bulbous base; the largest leaflets, those near the base, 30–38 cm. long, 15–20 mm. broad; the uppermost shorter, less acuminate, the two of the terminal pair quite free at the base; the leaves of young shoots in not fully-grown plants are shorter, have the sheaths covered with a thin rusty-furfuraceous indumentum, the liguliform ocrea shorter and smooth, the petiole even 50 cm. long, subterete and armed with longer straight spines, the leaflets shotrer and relatively broader, subequidistant and less spinulous on the nerves. *Male spadix* . . . . . *Female spadix* (not seen entire); partial inflorescences with many approximate distichous spikelets; the largest I have seen 35 cm. long with 13 spikelets on each side, terminating in a short, rather thick, unarmed, sheathed, tail-like appendix; other inflorescences, which probably are from the upper part of the spadix, are much shorter and with fewer spikelets; secondary spathes rather short, infundibuliform, unarmed, thinly coriaceous, polished, truncate at the mouth, usually longitudinally split, prolonged at one side into a broadly triangular, acute point; spikelets thick, rigid, strongly arched and deflexed, attached inside the mouth of their respective spathes; the lower ones the largest, about 7 cm. long, with 14–15 flowers on each side, the uppermost slightly shorter; spathels approximate, broadly infundibuliform, thinly coriaceous, not distinctly veined and almost polished, horizontally truncate and entire at the mouth, shortly extended at one side into a triangular point; involucrophorum almost entirely immersed in its own spathel and attached to the base of the one above, cupular, bi-dentate and acutely two-keeled on the side next to the axis; involucre irregularly cupular, unilaterally evolute, sub-auriculiform, polished and smooth internally, rather thick and subcoriaceous in texture; areola of the neuter flower large, ovate concave, with sharp raised borders. *Female flowers* about 5 mm. long, the corolla very slightly longer than the calyx. *Fruiting perianth* not pedicelliform, split into 6 almost equal, ovate-lanceolate, acute parts. *Fruit* ovoid, rounded at the base, conically narrowed at the apex or slightly contracted into a broad conic rather obtuse point, 16–18 mm. long, 11–12 mm. broad; scales in 15–18 series, shining, deeply channelled along the middle, yellowish-brown with a darker, narrow, rusty-reddish, intramarginal line, the tip rather acute and, like the margins, erosely toothed. *Seed* ovoid or oblong, 10–12 mm. long, rounded to both ends or slightly apiculate, convex and obsoletely furrowed longitudinally on the back, slightly flattened, with an elliptic, not very deep central chalazal fovea on the raphal side; albumen bony, equable; embryo basal.

HABITAT.—Central Africa: discovered by *Dr. Schweinfurth* in the Niam-Niam country at Mansilli (No. 2860, 7th February 1870), and at Nabambisso, 6th May 1870 (No. 3703); at Lado on the White Nile, collected in fruit by *Dr. Emin Pasha*, 1883 (Herb. Schweinfurth); Ussororo, collected by *Dr. Stuhlmann* (Emin Pasha Exp., 1891, No. 2531 in Herb. Schweinfurth).

OBSERVATIONS.—I have been able to write an almost complete description of this, Dr. Schweinfurth having most liberally placed in my hands all his specimens of Calamoid palms from Central Africa, which apparently belong to only one species (that described above) and to an *Eremospatha*, apparently new but allied to *E. Hookerii* (*E. Schweinfurthii* Becc.; ♂ Schweinfurth No. 3675). Schweinfurth's specimens of *C. Schweinfurthii* are of a few entire leaves detached from full-grown plants and of the terminal portion of some young leafy shoots; while those of Dr. Emin Pasha consist only of some partial inflorescences with ripe fruit without leaves. There is not therefore any absolute evidence that the leaves described by me and the fruit belong to the same species, still I have little or no doubt about it, as both fruit and leaves are very similar to the corresponding parts of the other true African *Calami* and especially to *C. deerratus* and *C. Heudelotii*.

C. Schweinfurthii differs from *C. deerratus* in its leaves having a very long petiole and in its fruit having larger not fimbriate scales; from *C. Heudelotii* in its larger and thicker spikelets with broadly infundibuliform spathels and in the different ornamentation of the ocrea. The fruit and the seed in the three mentioned species are very similar; certainly they are very nearly allied species. I first assigned the name of *C. Schweinfurthii* in 1892 to a specimen (Schweinf. No. 2860) which I had seen in the Herbarium at Kew. Now Prof. O. Drude in a paper on the Palms of Tropical Africa in Engler's "*Botanische Jahrbücher* xxi, 1896," mentions my *C. Schweinfurthii* and insists on referring it to *Ancistrophyllum secundiflorum*, basing this opinion on the supposition that all non-cirriferous leaves in *Calamus* must belong to young plants, and adding that these leaves ought not to be collected and preserved in good collections; but it is quite certain that entire sections of *Calamus* never have cirriferous leaves, and to this class belong all the African *Calami* known to me. Moreover, the leaflets of *Ancistrophyllum* are slightly sigmoid, while in *C. Schweinfurthii*, as in all true *Calami* (African or Asiatic), the leaflets are straight.

The diagnostic characters of *C. Schweinfurthii* are the elongate leaves with the petiole very long, flat above and round beneath; the numerous inequidistant, not distinctly fascicled, narrowly ensiform leaflets: the ocrea prolonged externally and spinulous on the ventral face; the female spikelets thick, with broad infundibuliform spathels; the fruit scales broad, in 15–18 longitudinal series, with narrow erosely toothed margin.

PLATE 26.—Calamus Schweinfurthii *Becc.* Basal portion of leaf from a young plant (Schweinfurth No. 3703) on the right hand side; basal portion and apex of a leaf from an adult plant (Schweinfurth No. 2860); partial inflorescence with mature fruit from a specimen collected by Emin Pasha (Herb. Schweinf.); seed from the dorsal side; seed longitudinally cut through the embryo.

21. CALAMUS PACHYSTEMONUS Thw. Enum. Pl. Zeyl. Addenda, p. 431; Hook. f. Fl. Brit. Ind. vi, 442; Becc. in Rec. Bot. Surv. Ind. ii, 201.
C. gracilis (not of Roxb.). Thw. l.c., 330.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* about 7 mm. in diam. *Leaf-sheaths* slightly gibbous above, sparingly armed with straight, solitary, scattered, unequal, very short and conical spines, which are occasionally 5–8 mm. long, horizontal and subulate. *Ocrea* in full-grown leaves very short, horizontally truncate, unarmed. *Leaves* short, 30–40 cm. long, not cirriferous, pauci-jugate; petiole very short, 3–4 cm. long, sub-terete, obsoletely channelled above, more or less armed beneath and at the sides with scattered unequal, mostly conical, straight, very short spines; rachis slightly furfuraceous, acute and bifaced above, more or less convex below where aculeate throughout up to the apex mainly along the middle; the lower aculei usually straight, the upper ones shorter and hooked or transformed into claws. *Leaflets* very few, 2–3 on each side, with a terminal pair, the side-leaflets irregularly set, 3–7 cm. apart, chartaceous, rigidulous, concavo-convex, almost shining above, slightly paler beneath, lanceolate, ovate-lanceolate or lanceolate-elliptic or oblanceolate or sub-obovate, 12–18 cm. long and 3 cm. broad (the lowest the smallest), tapering towards and acute at the base, rather suddenly narrowed upwards into an acuminate and bristly tip, and furnished with 3–5 fine and acute costæ which run from the base up to the apex with minor nerves between them, all naked above; the mid-costa stronger than the side ones, usually furnished with very few, short, erect spinules beneath, where the other nerves are smooth; margins acute, smooth (not ciliate or spinulous), the lower one usually bordered on the upper surface with a rather broad, brown, polished band which is occasionally accompanied by a few others running along the main nerves; the two terminal leaflets larger and broader and more suddenly acuminate than the side ones, connate up to about the middle. *Male spadix* as in *C. digitatus*, with very few partial inflorescences (only two in the spadices seen) and prolonged into a slender aculeolate flagellum; primary spathes very narrow and long, cylindrical, strictly sheathing as in *C. digitatus*; partial inflorescences 10–14 cm. long, narrow, dense, of equal breadth at the base and at the apex, ascendent at first, then arched and nodding, inserted inside their own spathe; secondary spathes tubular-infundibuliform, finely striate, produced at the apex at one side into a deflexed point; spikelets short, 1–1·5 cm. long, strongly arched downwards or subscorpioid, inserted at the mouth of their own spathe with a distinct axillary callus and bearing 5–15 very closely packed flowers on each side; spathels scale-like, concave, strongly veined, acute; involucre cupular, shorter than the spathels, obscurely and broadly 3-toothed, strongly veined. *Male flowers* slender, cylindrical, 5 mm. long and 2 mm. thick, slightly curved, obtuse and somewhat callous at the top; calyx campanulate, strongly striately veined, with 3 short broad acute lobes; corolla twice as long as the calyx, divided down to the lower third of its length into 3 linear, callous, apiculate segments, which are strongly longitudinally striate outside; stamens in two series of unequal length, their filaments united as high as the middle of the corolla, in the free portion thick near the base, subulate and not inflected at the apex; anthers sagittate-lanceolate, acute, the connective and the filament black when dry; rudimentary ovary very small, formed by three small approximate clavate bodies which are shorter than the filaments. *Female spadix* and *fruit* unknown.

HABITAT.—Ceylon: in the neighbourhood of Galle, *Thwaites.* I have seen a good specimen of this species in the Herbarium at Paris, gathered at Caltura by Leschenault in July 1820.

OBSERVATIONS.—The specimens of the "Ceylon Plants," which exactly agree with the description of *C. pachystemonus* of Thwaites, bear the No. 2334 and were prepared from plants originally found in the jungle near Galle and introduced into the Botanical Garden at Peradeniya; but with the same No. 2334 specimens of *C. digitatus* have been also distributed. And indeed *C. pachystemonus* is closely related to *C. digitatus* with which it has been amalgamated by Thwaites, but from which it is easily distinguishable by the pinnate leaves, as described above. The male flowers are also larger n *C. pachystemonus* than in *C. digitatus*, and are callous at the top, with the filaments of the stamens thicker, shorter and more agglutinate.

C. pachystemonus, *C. digitatus* and *C. radiatus* form a small group, peculiar to Ceylon, distinguished chiefly by the elongate curved flowers with biseriate stamens and filaments not inflected at the apex and with erect anthers when in the bud.

Leschenault's specimen has the leaf with two leaflets on each side of the rachis besides the terminal pair; the leaflets have not the small spinules on the mid-costa on the lower surface, as in Thwaites's specimens.

PLATE 27.—Calamus pachystemonus *Thw.* An entire leaf seen from the lower surface; the base of another seen from the upper one and an entire male spadix, from Thwaites's specimen in Herb. Kew.

22. CALAMUS DIGITATUS Becc. in Hook. f. Fl. Brit. Ind. vi, 442; Becc. in Rec. Bot. Surv. Ind. ii, 201.
C. pachystemonus (partly) Thw. Enum. Pl. Zeyl. 431.

DESCRIPTION.—High scandent, very slender. *Sheathed stem* 5–8 mm. in diam. *Leaf-sheaths* very slightly gibbous above, more or less armed with subulate, elongate or short, slender, horizontal spines or sometimes almost unarmed or only transversely rugose. *Ocrea* smooth or spinulous, at first liguliform, 5–7 mm. long, very soon withered and deciduous, therefore apparently short and very obliquely cut off. *Leaves* very short with very few sub-digitate or indistinctly sub-pinnate leaflets; petiole subterete channelled above, 7–8 cm. long, sometimes almost unarmed, usually furnished near the base laterally with some straight, rather strong, ascendent spines and armed below with a few distant irregular claws of which a few sometimes also appear on the very short rachis; leaflets mostly only two, sometimes 3–4, but whatever be their number the two of the terminal pair more or less confluent at the base and the side ones, when these are present, quite free and very approximate to the terminal pair, or exceptionally 15–20 mm. apart, and therefore sub-pinnately set; furthermore the leaflets are oblong-spathulate, or oblanceolate, slightly narrowed at the base, enlarged upwards, where somewhat convex above and very suddenly contracted into a short bristly-brushed tip, 20-30 cm. long and 3–6·5 cm. broad (the lower ones usually slightly narrower than the upper ones), chartaceous, rigidulous, shining and acutely 3- or exceptionally in the terminal leaflets 5-costate above (the mid-costa the strongest), with intermediate, often rather prominent, secondary costæ and other minor nerves; all nerves naked on both surfaces; margins acute, smooth; the lower margin bordered with a polished band as in *C. pachystemonus;* transverse veinlets slender, sharp and crowded. *Male* and *female spadices* very much the same, very slender, 1–1·5 m. long, flagelliform, terminating in a very slender, filiform, aculeolate appendix with a callous swelling at their insertion and a transverse rima in their upper axilla, simply decompound, with 2–6 partial inflorescences; primary spathes tubular, very closely sheathing, very narrow, the lowermost flattened, spinulous near the base, the upper ones cylindrical, aculeolate, truncate at the mouth, acute or acuminate at one side and often split at the apex; partial inflorescences straight, elongate, 8–15 cm. long, narrow, dense, bearing distichously 10–20 short approximate spikelets; secondary spathes tubular infundibuliform, glabrous, striately veined, longitudinally truncate and not ciliate at the mouth, apiculate at one side; spikelets inserted just at the mouth of their own spathe, arched or subscorpioid and strongly deflexed, with a distinct callus and a transverse rima in their upper axilla. *Male spikelets* 8–10 mm. long, with 5–8 (seldom more) flowers on each side; spathels very crowded, concave, scale-like, broadly-ovate, acute; involucre dimidiately cupular, obliquely truncate, flat and two-keeled on the side next to the axis. *Male flowers* very closely packed, slender, cylindrical, curved or subfalcate, rather obtuse, 4 mm. long, 1 mm. thick; calyx campanulate, strongly striately veined with 3 short, broad, acute lobes; corolla two and a half or three times as long as the calyx, divided down almost to the base into 3 linear, acute, striate segments; stamens 6, arranged in two series, 3 longer than the others, their filaments thickened at the base, subulate and not inflected at the apex; anthers lanceolate-sagittate, dorsally attached (erect and not versatile during the anthesis?); their connective perfectly black when dry; rudimentary ovary formed by 3 small clavate bodies which are shorter than the filaments. *Female spikelets* larger than the male ones, the largest 2 cm. long, with 8–10 very approximate flowers on each side; spathels very short and broad, subspathaceous, strongly striately veined, acute at one side; involucrophorum obliquely infundibuliform, truncate, almost completely sunk in its own spathel and attached to the base ot the one above; involucre cupular, rather deep, entire, obliquely truncate; areola of the neuter flower very large, broadly ovate, acute, deep, sharply defined by a raised border. *Female flowers* ovoid, acute, about 3 mm. long; calyx divided into 3 ovate, acute, striately-veined lobes; corolla about one-third longer than the calyx, its segments striate, lanceolate, acute; stemens with filaments united at the base and dentiform in the free part. *Neuter flowers* scarcely smaller than the fertile ones. *Fruiting perianth* explanate under the fruit, not pedicelliform. *Fruit* globular, 9–10 mm. in diam., very shortly mucronate ; scales in 12 series, distinctly longer than broad, faintly channelled along the middle, yellowish, neatly bordered with a narrow reddish-brown band which is a little larger towards the shortly prolonged, obtuse, denticulate tip; their margins erosely denticulate. *Seed* subglobose, 6·5 mm. long, with a slightly depressed chalazal fovea on the raphal side, otherwise with even surface; albumen equable; embryo basal.—One fruit had two seeds, which were flat on the ventral face and convex on the back.

HABITAT.—Ceylon, in the southern part of the Island. Distributed by Thwaites with the same number as *C. pachystemonus* (C. P. No. 2334). It was first discovered by Major-General Walker, according to a specimen in the Kew Herbarium. Another specimen collected by Gardner is in Webb's Herbarium at Florence.—Singalese name 'Kookool-wel.'

OBSERVATIONS.—Very closely related to *C. pachystemonus* (see observations on this species) and *C. radiatus*. From the last it differs in the fewer, broader and many-nerved leaflets, and in the fruit with scales in 12 instead of 15 series.

PLATE 28.—Calamus digitatus *Becc.* Fruiting specimen from St. Petersburg Herbarium.

PLATE 29.—Calamus digitatus *Becc.* Female specimen in flower (on the right-hand side) from a specimen in De Candolle's Herbarium; male specimen in flower on the left side from Webb's Herbarium.

23. CALAMUS RADIATUS. Thw. Enum. Pl. Zeyl. Addenda, 431; Hook. f. Fl. Brit. Ind. vi, 442; Becc. in Rec. Bot. Surv. Ind. ii, 20.

DESCRIPTION.—High scandent, very slender. *Sheathed stem* 5–7 mm. in diam. *Leaf-sheaths* sometimes flagelliferous, not distinctly gibbous above, more or less densely covered with straight, elongate or short, subulate, slender, horizontal spines, which are solitary or confluent by their broad bases and subseriate, longer, more numerous and pointing upwards near the mouth. *Ocrea* short and obliquely truncate in full-grown leaves. *Leaves* not pinnate, but with 5–8 digitate or radiate leaflets grouped at the apex of the petiole; petiole 5–7 cm. long, subterete, narrowly channelled above, sparsely spinulous throughout and sparingly clawed on the back, leaflets rigidulous, chartaceous, about 25 cm. long, and 15–22 mm. broad, the two of the centre united at the base, all about of the same length, very broadly linear (the outer usually narrower than the central ones), shortly attenuate at the base, very suddenly contracted at the apex into an acuminate and very sparingly bristly-spinulous tip, shorter in the centre leaflets, shining above, paler beneath, with the mid-costa slender but very acute and with 3–4 slender secondary nerves on each side of it; transverse veinlets slender, sharp, rather crowded, much interrupted; margins smooth; the mid-costa and nerves smooth on both surfaces. *Male spadix* . . . . . *Male flowers* (as described by Thwaites) cylindraceous-falcate; calyx twice as long as broad, with 3 short, acute, triangular lobes; corolla about three times longer than the calyx, divided down almost to the base into 3 linear, acute segments; stamens with filaments thickened in the lower half. *Female spadix* simply decompound, inserted near the mouth of the leaf-sheath with a distinct basal callus and a transverse axillary rima, flagelliform, very slender, with very few partial inflorescences (2–6, *Thwaites*), and prolonged into a filiform minutely and densely clawed flagellum; primary spathes tubular, very narrow and long, very closely sheathing, obliquely truncate at the mouth, rather densely armed with scattered small claws; the lowest flattened, the upper ones cylindraceous; partial inflorescences small, delicate, 5–8 cm. long, inserted at or above the mouth of their own spathe with 2–4 spikelets on each side; secondary spathes very narrowly tubular, slightly enlarged above, glabrous, longitudinally striately veined, truncate and apiculate at one side at the mouth; spikelets inserted just at the mouth of their own spathe with a callus and transverse rima at their upper axilla, very short (1–2·5 cm.), distichous, strongly deflexed, the largest—the lowest—with 6–7 flowers on each side; the upper somewhat smaller and with fewer flowers; spathel obliquely infundibuliform, much narrowed at the base, apiculate at one side at the mouth where some strong nerves converge; involucrophorum shortly infundibuliform, obliquely truncate, attached at the base of the spathel above its own; involucre deeply cupular or sub-infundibuliform, entire, obliquely truncate at the mouth, strongly striately veined, callous at the base; areola of the neuter flower broadly ovate or nearly round, with a very sharp border. *Female flowers* ovoid-acute, about 3 mm. long; calyx acutely trilobate; corolla divided into 3 lanceolate, acute segments, one-third longer than the calyx; calyx and corolla strongly striately veined; stamens with the filaments united by their bases, elongately triangular in the free portion. *Fruiting perianth* explanate (not pedicelliform). *Fruit* globular, 10–11 mm. in diam., supported by the somewhat pedicelliform involucre and tipped by a distinct mucro; scales in 15 series, distinctly broader than long, faintly channelled along the middle, yellowish, sharply bordered with a narrow reddish-brown band which is a little broader towards the shortly prolonged, obtuse, denticulate tip; margins finely erosely denticulate. *Seed* irregularly globose, about 8 mm. long, with almost even surface; chalazal fovea small, slightly depressed on the raphal side; albumen equable; embryo basal.

HABITAT.—Ceylon: in the southern districts of the Island (*Walker* in Herb. Kew; *Thwaites* C. P. No. 3805).—Singalese name 'Kookool-Wel.'

OBSERVATIONS.—A very elegant species remarkable among all Asiatic *Lepidocaryeæ* by its digitate leaves, resembling those of the American *Lepidocaryum.* It is also easily distinguished from the two related species, *C. pachystemonus* and *C. digitatus*, by the unicostate and peculiarly arranged leaflets.

PLATE 30.—Calamus radiatus *Thw.* Portion of a plant with a female spadix in flower, from Thwaites' No. 3805 in De Candolle's Herbarium.

24. CALAMUS RUVIDUS Becc. in Rec. Bot. Surv. Ind. ii, 202.

DESCRIPTION.—Scandent. *Leaf-sheaths* . . . . . *Leaves* not cirriferous; petiole . . . . . , rachis acutely bifaced and smooth above, armed beneath throughout with rather strong, solitary, scattered claws; leaflets very few, remote, alternate, oblanceolate, rather concave beneath, somewhat suddenly acuminate, long-attenuate at the base, chartaceous, rigid, about the same colour perfectly glabrous and shining on both surfaces, 28–30 cm. long and 3·5 cm. broad, with 5 costæ, which are acute above but prominent also on the lower surface and naked on both; transverse veinlets very fine, approximate and continuous; margins smooth; the two terminal leaflets a little shorter but broader than the side ones and united in the lower third of their length, suddenly contracted at the apex into a bristly-penicillate tip. *Male spadix* . . . . . *Female spadix* not flagelliform, paniculate, with not many, approximate, partial inflorescences and terminating in a long spikelet, which bears at its base a finely clawed filiform appendix 7 cm. in length (a rudimentary flagellum); primary spathes not very elongate (5–10 cm.), closely sheathing in their lower portion, somewhat enlarged and loose above, finely striated longitudinally, thinly coriaceous, glabrous, greenish-brown, armed with small scattered claws in their lower portion, decayed and falling to pieces (not fibrous) in their upper part, the dead part sharply defined from the living; partial inflorescences approximate, all (except the uppermost which is smaller) of about the same size, 15–18 cm. long, inserted inside their own spathe, at first ascendent, then arched, bearing 8–10 spikelets on each side and terminating in a spikelet longer than the side ones; secondary spathes strongly and densely scabrid-papillose, tubular-cylindraceous and strictly sheathing in their basal portion, suddenly enlarged near the mouth and extended at one side into a rather long, triangular, subulate, decayed point; spikelets vermicular, inserted just at the mouth of their own spathe, slightly callous at their upper axilla, horizontal and somewhat arched, the largest, the lowest, 6–7 cm. long, with 15–20 very approximate flowers on each side; the upper a little shorter; spathels very densely scabrid-papillose, with a very short tubular basal part and suddenly expanded into a concave subcymbiform limb, which is prolonged at one side into a triangular, acute, spreading or deflexed tip; involucrophorum shallowly cupular, attached almost outside its own spathel at the base of the one above; involucre more or less regularly cupular, often asymmetrically evolute, strongly striately veined; areola of the neuter flower very large, flattish, almost circular, very sharply bordered, sometimes only slightly smaller than the involucre. *Fruiting perianth* explanate; the calyx divided into 3 broad indistinctly veined lobes; the segments of the corolla lanceolate, one-half or one-third longer than the calyx, smooth outside. *Fruit* (unripe) very small (7 mm. in diam.), spherical, very shortly beaked; scales in 16 series, yellowish-brown, convex, very faintly channelled along the middle, with scarious finely erose margins and tip, where sometimes they are marked with an indistinct intramarginal line.

HABITAT.—Borneo; Sarawak, (*Lobb* in Herb. Kew).

OBSERVATIONS.—I have seen of this only one specimen (preserved at Kew) consisting of the upper part of a leaf and the apex of an immature fruiting spadix. This portion of spadix (probably the greater part of it) is 40 cm. long and bears 4 partia inflorescences. *C. ruvidus* is a near ally of *C. scabridulus* and *C. radulosus* by its very scabrid secondary spathes, spathels and involucres; it differs however from both in the leaves having very few, 5-costulate, somewhat concave leaflets, which are oblanceolate or broadest above the middle, without bristles or spines, and in the rather compact female spadix with few short and approximate partial inflorescences. The characters assigned by me to the leaf-sheaths in the diagnosis of *C. ruvidus* in the Records" l. c. belong to a male specimen preserved at Kew, which I doubtfully referred to that species, but which I now think it safer not to take into account. This last specimen was gathered by Motley at Banjarmassing in Borneo.

PLATE 31.—Calamus ruvidus *Becc.* The complete type-specimen preserved at Kew.

25. CALAMUS SCABRIDULUS Becc. in Rec. Bot. Surv. Ind. ii, 203.

DESCRIPTION.—Scandent, slender or of moderate size. *Leaf-sheaths* . . . . . . *Leaves* not cirriferous; petiole . . . . . ; rachis of the upper part of the leaf armed beneath with rather stout solitary black-tipped claws; leaflets not very numerous, subequidistant, rather remote, 4–7 cm. apart, flat, papyraceous, rigidulous, narrowly lanceolate or ensiform, almost equally narrowed to both ends, very gradually acuminate into a subulate apex, 40–45 cm. long and 2–2·5 cm. in breadth, the upper ones somewhat shorter, the two of the terminal pair shortly connate at the base, 23–25 cm. long, but a little broader than the others; all almost concolorous, shining and very finely longitudinally striate under the lens on both surfaces, furnished above with 3 rather acute bristly-spinulous costæ and with in addition another more slender naked nerve near the margin; on the under surface the 3 costæ less prominent than above and sparingly spinulous near the apex; transverse veinlets very distinct, sinuous and interrupted; margins indistinctly, remotely and appressedly spinulous. *Male spadix* . . . . . *Female spadix* (not seen entire) with very slender and long (50 cm.) partial inflorescences, these terminating in a short (3–4 cm.) filiform, very acute, scabridulous appendix and bearing about 10 spikelets on each side; secondary spathes very narrowly tubular and very closely sheathing, somewhat clavate in their upper part, flattish inside at the base, 1·5–2·5 cm. long, scabrid, finely aculeolate upwards on the back, entire, obliquely truncate and ciliated at the mouth, where produced at one side into a lanceolate and acuminate point; spikelets vermicular, slender, slightly arched, attached just above the mouth of their own spathe and deflexed by the pressure of a very distinct axillary callus; the lowest spikelets, the largest, 6 cm. in length, with above 20 distichous flowers on each side, the upper ones gradually smaller, those near the apex 2·5 cm. long with proportionately fewer flowers; spathels very broadly infundibuliform or concave and sub-bracteiform, prolonged at one side into an acute tip, densely scabrid-papillose and strongly striately veined; involucrophorum unilaterally subcupular, almost exserted from its own spathel and attached at the base of the one above; involucre asymmetrically cupular, obscurely lobulate; areola of the neuter flower relatively large, broadly ovate, sharply bordered with a discoid subcircular callus in its centre. *Female flowers* small, 2·5 mm. long (perhaps when not fully developed), conic-ovoid, acute; the calyx with a callose base, strongly striately veined, broadly 3-toothed; corolla twice as long as the calyx. *Fruit* not seen.

HABITAT.—Billiton Island in the Java Sea (*Riedel* 1876, in Herb. Becc.)—Malay name 'Rotang mengkekeran' (Keker = a file).

OBSERVATIONS.—This species is very nearly allied to *C. ruvidus* and especially to *C. radulosus*, and the secondary spathes and the involucres are very scabrid as in those two. From *C. ruvidus* it dffiers in the more numerous, flat and not more or less concave ensiform leaflets, which are bristly spinulous on 3 costæ, and in the spadix with elongate partial inflorescences which bear many remote spikelets. From *C. radulosus* it differs in the leaflets which slightly decrease in length in the upper part of the leaf and have the two ultimate leaflets larger than the lower ones, and in the much more slender partial inflorescences and spikelets.

PLATE 32.—Calamus scabridulus *Becc.* The terminal portion of a leaf (upper surface); the portion of the same following (under surface); two partial inflorescences with female flowers.—From Riedel's specimen in Herb. Becc.

26. **CALAMUS MURICATUS** Becc., Nelle Foreste di Borneo 609, and in Rec. Bot. Surv. Ind. ii, 203.

DESCRIPTION.—Slender, scandent. *Stem* with the sheaths 13–16 mm. thick. *Leaf-sheaths* flagelliferous, slightly gibbous above, obliquely truncate at the mouth, very conspicuously armed with straight, horizontal, subwhorled spines which are 4–5 mm. long and rest on approximate, prominent, annular ridges, these being alternate with other smaller, sinuous, interrupted ridges or wrinkles, which are armed with very small spines or are simply scabrid on their crest; the base of the petiole or the apex of the sheath bears many such wrinkles. *Ocrea* very short, inconspicuous. *Leaf-sheath flagella* filiform, very slender, armed with very fine, small, ternate or half-whorled claws. *Leaves* not cirriferous; petiole rather long (40 cm.), sub-biconvex in section in its upper part, slightly flattish above and convex beneath near the base, sparingly aculeolate on the back and at the margins upwards; rachis flat and above bifaced and smooth, glabrous, armed with small, solitary, scattered claws beneath; leaflets not very many, 14–15 on each side, thinly papyraceous, very inequidistant, scattered, not distinctly grouped, linear, very elongate, the largest, those a little above the base, 35 cm. long, 13–14 mm. broad, gradually narrowed to the base, and gradually acuminate at the apex into a subulate bristly tip, about the same colour on both surfaces, sub-3-costulate, or with the mid-costa rather acute and one distinct acute nerve on each side of it, all the 3 sparsely bristly-spinulous above, beneath, the mid-costa only bristly; margins very adpressedly and inconspicuously spinulous; transverse veinlets very minute, much interrupted; the two terminal leaflets smaller than the others and free at the base.—Other parts unknown.

HABITAT.—Borneo; on Mt. Mattang, near Kuching in Sarawak (*Beccari* P. B. No. 1928.)—Malay name 'Rotang sakkat.'

OBSERVATIONS.—Allied to *C. zonatus*, but distinct in its larger size, in the more powerfully armed leaf-sheaths, in the longer petioles and larger leaflets which are setose on 3 nerves above. The diagnostic characters of *C. murieatus* are the armature of the leaf-sheaths formed by whorled short spines which rest on annular raised ridges alternating with interrupted wrinkles; the leaves with a long petiole and the not numerous, inequidistant, very narrow leaflets, which are bristly on 3 nerves above.

PLATE 33.—Calamus muricatus *Becc.* The entire (sterile) type-specimen in Herb. Beccari.

27. CALAMUS ZONATUS Becc., Nelle Foreste di Borneo 609, and in Rec. Bot. Surv. Ind. ii, 203.

DESCRIPTION.—Very slender, scandent. *Sheathed stem* 7–8 mm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, striate longitudinally, conspicuously ornamented with approximate, sinuous, unequal, sometimes interrupted, annular ribs or prominent wrinkles which are scabrid on their crests or sometimes furnished with pungent warts or rudimentary spinules. *Leaf-sheath flagella* very long, slender and very finely clawed. *Leaves* delicate, not cirriferous, 50–70 cm. in length; petiole short, 2–5 cm. long, flattish or slightly channelled above, rounded beneath where rather strongly aculeate along the middle and at the sides; rachis glabrous, acutely bifaced above, finely irregularly clawed throughout beneath; leaflets not many, 10–12 on each side, inequidistant, scattered, not distinctly grouped or fascicled, elongate-linear, the largest (those a little above the base) 20–28 cm. long, 10–12 mm. broad, all almost equally attenuate at both ends, acute at the base, gradually acuminate at the apex into a subulate bristly tip, thinly papyraceous, rather rigid, of the same colour and sub-shining on both surfaces, distinctly 3-costulate, the mid-costa sparingly bristly above; all nerves naked beneath; margins smooth, only the apex ciliate; tranverse veinlets fine, much interrupted; the two terminal leaflets smaller than the others, more or less shortly connate at the base. *Male spadix* partially ultra-decompound, elongate, filiform, flagelliform, with few remote, very delicate partial inflorescences; primary spathes very narrow and long, very closely sheathing, the lowest slightly flattened, obliquely truncate and entire at the mouth, almost unarmed; the upper ones cylindraceous, extremely narrow, aculeolate mainly in their upper part; unsheathed axial portions of the spadix between two partial inflorescences very slender, clawed on the outer side; partial inflorescences 20–40 cm. long, inserted above the mouth of their own spathe, divaricate, with a conspicuous axillary callus; the lowest inflorescedces (the largest) decompound, with 1–3 branches on each side near the base and 5–6 simple spikelets (also on each side) in the upper part; secondary spathes very narrow, very closely sheathing, slightly clavate, scabridulous, obliquely truncate at the mouth, acute at one side, the lowest 4–5 cm. long, the upper ones gradually shorter, the uppermost 15–20 mm. long; spikelets 3–6 cm. long, very slender and delicate, filiform, straight, horizontal, attached above the mouth of their own spathe with a distinct axillary callus and bearing 18–20 horizontally inserted flowers on each side; spathels tubular-cylindraceous at the base, suddenly expanded into a short, infundibuliform, truncate, scabrid limb; involucre completely exserted from its own spathel and laterally attached to the base of the one above, subdiscoid or shortly cupular, with a short, obsoletely bidentate, strongly striately veined limb.—Other parts unknown.

HABITAT.—Borneo; Mt. Mattang, near Kuching in Sarawak (*Beccari* P. B. No. 1921.)—A specimen gathered by Lobb, probably also in Sarawak (Herb. Calc.), bears a male spadix, but all the flowers have fallen.

This species produces a very slender Rotang of great toughness, used by the Malays of Sarawak for fastening the iron blade of their axes to the handle, whence its name of 'Rotang perdas' (*perdas* = the handle of the Malayan axe).

OBSERVATIONS.—My specimen No. 1921 is sterile. The Calcutta specimen does not essentially differ from it; only the annular ribs or ridges of the leaf-sheaths are a little more prominent and bear here and there some rudimentary spines in the shape of conical pungent warts; furthermore the leaflets are quite smooth in the upper surface, and no hairs or spinules are visible on the mid-costa. It is very closely allied to *C. muricatus*, but is more slender and delicate in every part and has the leaf-sheaths spineless or almost so.

PLATE 34.—Calamus zonatus *Becc.* The Calcutta specimen with a male spadix devoid of flowers.

28. CALAMUS RADULOSUS Becc., in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 203.

DESCRIPTION.—High scandent, of moderate size. *Sheathed stem* 2·5–3 cm. in diam. *Leaf-sheaths* obliquely truncate and naked at the mouth, very densely armed with very short and broad (4–6 mm. long), sub-triangular, scattered spines, which are obliquely inserted and ascendent (never deflexed), conspicuously swollen above and flat beneath. *Leaf-sheath flagella* as long as the leaves. *Leaves* rather large, 1·2–1·5 m. long; petiole obsolete; rachis bifaced above, armed below with black-tipped always solitary claws, which are numerous and pluriseriate lower down and on a single line in the upper portion; leaflets numerous, equidistant, rather closely set (2–3 cm. apart), papyraceous, green, glabrous, rather shining and almost of the same colour on both surfaces, under the lens finely longitudinally striately veined on the lower one, ensiform, finely acuminate at the apex, gradually narrowing at the base, furnished with 3 acute but not very strong costæ and with another faint secondary nerve near the margin, the mid-costa alone sometimes bristly, the 3 costæ rather closely bristly beneath towards the apex, but fainter than above; transverse veinlets very sharp, much interrupted; margins apparently naked, but under the lens very adpressedly, minutely and remotely spinulous; the largest leaflets, the mesial, 45 cm. long and 25 mm. broad at most, the lowermost a good deal narrower than the mesial, the upper gradually decreasing in length and breadth; the two of the terminal pair the smallest, 13–15 cm. long and 8–12 mm. broad, shortly connate at the base. *Male spadix* ultradecompound. *Female spadix* very long (3·5–4·5 m., *Scortechini*) and robust, with many remote partial inflorescences, sub-flagelliform at the apex and terminating in a slender, tail-like, unsheathed appendix about 20 cm. long; primary spathes very elongate, closely sheathing, thinly coriaceous; the basal one about 50 cm. long, somewhat flattened, about 15 mm. broad, acutely two-edged, obliquely truncate at the mouth, armed, mainly on the outer side, with small scattered hooked spines; the upper spathes cylindraceous, often split longitudinally in the upper part, where usually decayed and falling to pieces, but not fibrous, aculeate throughout, but not scabrid; unsheathed axial portions of the spadix, between two partial inflorescences, elongate, flat on the inner and convex on the outer side where armed with small scattered claws; partial inflorescences very long, the lowest as much as 1 m., the uppermost 30 cm. in length, bearing distichously many (10–15 on each side) spikelets; secondary spathes tubular-infundibuliform, somewhat enlarged above, where later usually split longitudinally on the inner side, obliquely truncate, scarious and lacerated at the mouth, apiculate at one side, strongly scabrid throughout and occasionally more or less aculeolate; spikelets vermicular, inserted just above the mouth of their own spathe, arched and deflexed, the largest, the lowest of each inflorescence, 8–9 cm. long with 20–23 distichous flowers on each side, the upper shorter and with fewer flowers; spathels short, bracteiform, concave or broadly boat-shaped, strongly striately veined, apiculate at one side, very scabrid-papillose; involucrophorum shallow, subcupular, almost exserted from its own spathel and attached to the base of the one above; involucre more or less asymetrically cupular, scarious at the margin; areola of the neuter flower large, ovate, with acute scarious borders. *Female flowers* closely packed, small (about 3 mm. long). *Fruiting perianth* explanate (not pedicelliform); the calyx deeply striately veined, broadly 3-lobate; the corolla with lanceolate segments, smooth outside, one-third longer than the calyx. *Fruit* (when still very young) very small, pisiform, globose, rather long-beaked; scales not channelled along the middle, yellowish-brown with a reddish line across the base of the scarious lacerated tip.

HABITAT.—Malayan Peninsula; Perak (*Scortechini* No. 468^b in Herb. Becc.); Goping (*King's Collector* No. 8171 in Herb. Calc.)—Malay name 'Rotang Kikier.'

OBSERVATIONS.—A very distinct species, remarkable for the armature of the sheaths and the scabridity of the secondary spathes, spathels and involucres, sharing, however, this last peculiarity with *C. ruvidus* and *C. scabridulus*. It differs from both in the leaves with the leaflets gradually decreasing in length from the middle towards the apex, the two apical leaflets being the shortest and the narrowest. It differs besides from *C. ruvidus* in its long spadices with very long partial inflorescences. The female spadix of *C. radulosus* seems very much the same as that of *C. scabridulus*, but in this the partial inflorescences and the spikelets are much more slender. Amongst Scortechini's specimens of *C. radulosus* there is a male spadix with very young flowers. It does not differ from the female one, and bears a partial inflorescence (the lowest) 1·2 m. in length, with many very long compound spikes on each side, which again bear distichously) many simple spikelets; the apex of the inflorescence bears only simple spikelets; the secondary spathes, the spathels and the involucres are scabrid as in the female spadix. The fruit has been described from No. 8171 of the Calcutta Herbarium.

PLATE 35.—Calamus radulosus *Becc.* Part of the sheathed stem with the base of two leaves and the basal portion of a spadix; an entire partial female inflorescence; the apex of a leaf seen from the lower surface; two detached leaflets with a portion of the rachis, seen from the under surface and taken from near the base of the leaf.—From Scortechini's specimen No. 468^b in Herb. Beccari.

29. CALAMUS RUGOSUS Becc. in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. of Ind. vii, 203.

DESCRIPTION.—Very slender, scandent. *Sheathed stem* 8–10 mm. in diam. *Leaf-sheaths* flageiliferous, gibbous above, obliquely truncate at the mouth, armed with confluent, sub-whorled, triangular, short (4–5 mm. long at most), laminar, sub-horizontal (not deflexed) spines, and further ornamented with many small, more or less interrupted annular ridges or wrinkles, which are fringed on the crest with very small confluent spinules. *Ocrea* inconspicuous. *Leaves* about 70 cm. long; petiole rather long] (14–17 cm. in length), slightly channelled above near the base, flat upwards, its margins very acute and armed—as is the lower rounded surface—with scattered, short, straight aculei; rachis acutely bifaced and smooth above, regularly and closely armed beneath with solitary, rather small claws; leaflets numerous, equidistant, rather closely set, linear-lanceolate, gradually finely acuminate into a subulate bristly tip, somewhat attenuate at the base, where suddenly plicate at their insertion on the rachis, thinly papyraceous, about the same colour on both surfaces, shining above, distinctly and rather densely bristly above on the acute mid-costa and on one rather slender nerve on each side of it; beneath only the mid-costa is bristly; margins distinctly and appressedly spinulous; the largest leaflets, those a little above the base, 15–17 cm. long and 8–10 mm. broad; the two terminal slightly smaller than the others and quite free at the base. *Male spadix* . . . . . *Female spadix* very slender, filiform, about as long as the leaves; with very few partial inflorescences; primary spathes very elongate and very narrow, very closely sheathing, the lowest somewhat flattened and acutely two-edged, the others cylindraceous, finely and densely aculeate, truncate and entire at the mouth; partial inflorescences spreading, very small and short (5–6 cm. long), inserted above the mouth of their own spathe, and with very few (usually 2) spikelets on each side distinctly callous at their upper axilla; secondary spathes scabrid, tubular, slightly enlarged above or very narrowly infundibuliform, closely sheathing, obliquely truncate at the mouth, where acute at one side; spikelets very short (15–20 mm. long) and relatively thick, horizontal, inserted at the mouth of their own spathe with a distinct axillary callus, and bearing 4–5 rather remote flowers on each side; spathels cylindraceous at the base, scabrid, striately veined and slightly infundibuliform in their upper half, horizontally truncate and entire at the mouth; involucrophorum sub-cupular, almost hollowed laterally into the base of the spathel above its own; involucre asymmetrically sub-cupular, with an irregular striately veined limb; areola of the neuter flower rather large, concave.—Other parts unknown.

HABITAT.—The Malayan Peninsula. Discovered in the district of Perak by *Scortechini* (Herb. Beccari); and in the same district found again by Ridley on the Thaiping Hills (*Ridley* No. 11314).

OBSERVATIONS.—This is allied to *C. zonatus*, but is quite distinct because of its spinous leaf-sheaths and the numerous equidistant leaflets, which are besides 1-costate and not 3-costate. The female spadix I have seen was an adult one, but without flowers; it was 70 cm. long and bore 3 partial inflorescences (all about the same dimensions), each with 4 spikelets in all.

PLATE 36.—Calamus rugosus *Becc.* Two portions of the sheathed stem, each with an entire leaf, and a female spadix without fruit.—From Scortechini's specimens in Herb. Beccari.

30. CALAMUS FLABELLATUS Becc. Malesia iii, 62, and in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—Scandent, very long and slender. *Sheathed stem* 5–6 mm. in diam. *Leaf-sheaths* flagelliferous, not or very indistinctly gibbous above, very obliquely truncate at the mouth, distinctly striate longitudinally, quite unarmed. *Ocrea* very short, almost obsolete. *Leaf-sheath flagella* filiform, very slender, finely aculeolate, callous at the base. *Leaves* simple, not pinnate, 45 cm. long, 10 cm. broad, elongate-flabelliform, papyraceous, green, of the same colour on both surfaces, gradually attenuate and acute at the base, furcate or divided in the upper third part of their length into two broadly lanceolate, acuminate, acutely 6–7-costate lobes; the costæ very acute, naked on both surfaces all of the same strength and all reaching the apex, and lower down meeting at different heights and at a very acute angle along the mid-costa of the blade; beneath, the mid-costa (or rachis) rather robust and sparingly clawed; margins acute, not ciliated or spinulous; transverse veinlets rather approximate and sharp; petiole 3–4 cm. long, slender, sub-trigonous, striate, unarmed.—Other ports unknown.

HABITAT.—Borneo; on Mount Mattang, near Kuching in Sarawak (*Beccari* P. B. No. 1911.)—The Rotang is of very good quality and is called in Sarawak Rotang Berman.'

OBSERVATIONS.—The only specimen I have preserved of this very peculiar *Calamus* is sterile, but it belongs to a nearly full-grown plant. Other species have undivided or furcate radical leaves, but this is the only one I know with furcate or flabellate leaves on the upper part of the stem. Its affinities are apparently with the species of the group of *C. javensis.*

PLATE 37.—Calamus flabellatus *Becc.* An intermediate portion of the leafy stem from P. B. No. 1911.

31. CALAMUS JAVENSIS Bl. Rumphia ii, 137 D. and iii, 62 (var. *α* and *β firmus*); Mart. Hist. Nat. Palm. iii, 337; Walp. Ann. iii, 487, and v, 831; Miq. Fl. Ind. Bat. iii, 125, in Pl. Jungh. 159, in Journ. de Bot. Neerl. i, 22, in Prodr. Fl. Sum. 256 and in De Palmis, 27; Teysm. Cat. Hort. Bog., 75; H. Wendl. in Kerch. Les Palmiers, 236; Becc. in Rec. Bot. Surv. Ind. ii, 201.

C. equestris Bl. (not of Willd.) in Roem. et Schult. Syst. Veg. vii, 2, 1330 (the Javan plant only); Mart. Hist. Nat. Palm. iii, t. 113 and t. 128 and 203 (1st edit.) and 207 (2nd edit.) partly; Kunth Enum. Plant. iii, 204 (partly) *C. equestris?* Zolling. Syst. Verzeich. 79 and Exsic. No. 1597? (non vidi) and No. 3696.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 5–8 mm. in diam. *Leaf-sheaths* distinctly striate longitudinally, green, glabrous, sparingly armed with straight 1–5 mm. long, solitary, horizontal or slightly deflexed spines. *Leaf-sheath flagella* with the lowest spathe usually smooth. *Ocrea* 5–12 mm. long, ciliate, naked or fugaciously furfuraceous. *Leaves* short, 30–50 cm. long; petiole very short or almost obsolete; leaflets very few, 3–6 on each side, more or less inequidistant, usually opposite or subopposite, oblong-lanceolate or lanceolate-elliptic, cuspidate, rather variable in size and in relative breadth, with 3 often spinulous costæ; the two leaflets near the base smaller than the others and spreading, the two of the terminal pair two-thirds connate. *Male* and *female spadix* as in var. *peninsularis. Fruit* 15-16 mm. long (including the beak), 9–10 mm. in diam., ellipsoid-ovoid, with rounded base and vertex topped by a cylindrical beak, this 1·5–2 mm. long; scales in 20–21 series. *Seed* about 1 cm. long and 7 mm. thick.

HABITAT.—Java and Sumatra. It seems common on the mountains between 250–1500 m. in Western Java, where it receives the name of 'Huy (Hooe) Omash' or 'Ommas,' (*Blume*); at Tapos in the forests of Mt. Patuha (*Junghuhn*), where it is known by the name of 'Rotang Tjatjing or Chaching'; in Bantam at Pasir Orai (*Forbes* No. 258 in Calc. Herb.). In Sumatra (*Forbes* No. 2507 in Calc. Herb.).—It produces one of the more slender and more esteemed Rotangs, much employed for tying, basket-making, matting, etc.

OBSERVATIONS.—This is a very variable species, perhaps the most polymorphic of the entire genus, and with a relatively wide geographical distribution, growing in the Malayan Peninsula and Borneo as well as Java and Sumatra. The type must be considered the Javan plant described and figured by Blume; the variety β of this author seems to me one of the usual forms of the type. A form with narrower leaflets than usual is that figured in Plate 113 of Martius' *Hist. Nat. Palmarum;* and indeed *C. javensis* even in Java varies very much in the size and relative breadth of the leaflets. I have not thought it necessary to give a detailed descriptive of the type of *C. javensis* as I have more fully described the var. *peninsularis* of which I had more complete specimens at my disposal and with which it agrees in most of its characters.

CALAMUS JAVENSIS subvar. EXILIS Becc.

DESCRIPTION.—*Sheathed stem* very slender, 4–5 mm. in diam. *Petiole* elongate (17 cm.). *Leaflets* very narrow (1·5–2 cm. broad).

HABITAT.—Java, *Reinwardt* in Martius' Herbarium at Munich.

OBSERVATIONS.—I do not know if this is a constant or a transitory form. The only specimen I have seen probably belongs to a rather young plant growing on high mountains. This variety may be considered as the Javan representative of var. *tenuissimus* of the form *peninsularis.*

CALAMUS JAVENSIS var. PENINSULARIS Becc. in Hook. f. Fl. Brit. Ind. vi, 442, and in Rec. Bot. Surv. Ind. ii, 201.

C. penicillatus Roxb. Fl. Ind. iii, 781.

DESCRIPTION.—Scandent, very slender, 3–10 m. high. *Sheathed stem* 5–10 mm. in diam. *Leaf-sheaths* sometimes flagelliferous, slightly gibbous above, always more or less distinctly striate longitudinally, armed with solitary scattered rather numerous or scanty spines, which are short or 7–8 mm. long, usually straight with a broad base, flat beneath, horizontal or sometimes with a tendency to become hooked, often scurfy at the margins. *Ocrea* membranous, 10–15 mm. long, unarmed, and with long fibrous cilia at the margin when young, brittle and falling to pieces later. *Leaf-sheath flagella* inserted near the mouth of the sheath in opposition to the petiole, callous at the base, filiform, rather long, with the lowest spathe slightly flattened and usually smooth, but sometimes sparsely aculeate on the back. *Leaves* short, 30–50 cm. long, not cirriferous; petiole very short or nearly wanting; rachis obsoletely bifaced above, rather densely armed beneath along the middle and at the sides with rather slender claws, which are usually scattered or 2–3-nate (mainly upwards) and sometimes near the apex half-whorled. Leaflets very few, 3-6 on each side, inequidistant, often opposite or subopposite, but never grouped on one side, of very variable shape but always relatively large in proportion to their length, lanceolate, oblong-lanceolate, and more frequently elliptic or ovate-elliptic, the largest (the intermediate) 15–18 cm. long, and 3–6 cm. broad, rigidulous, papyraceous, glabrous, green or occasionally vinous-purpurascent, faintly paler beneath, narrowed to the base, where acute, rather suddenly acuminate into an acute tip (this bristly-penicillate when young), furnished, at almost equal distances, with 3 primary costæ; these all reaching the apex and of about the same strength, acute and raised above, less prominent beneath, smooth (not spinulous or bristly) on both surfaces, with one slender but distinct secondary nerve interposed between each of them and the margins; transverse veinlets distinct, very crowded and continuous; margins acute, smooth throughout except at the extreme apex where ciliate; the lower margin often bordered on the upper surface with a narrow polished band; the two leaflets of the terminal pair somewhat longer, broader and more enlarged towards the apex than the side ones, connate in the lower two-thirds of their length; the basal pair, and sometimes the next, smaller than the upper ones and inserted very near the mouth of the sheath, distinctly callous and as if they were articulated at the base, strongly deflexed, concave and often the two connivent and almost embracing the stem. *Male spadix* simply decompound or partially ultradecompound, inserted with a conspicuous basal callus near the mouth of the sheath opposite the leaf, or nearly so, very variable in length (from 60 cm. to 3 m.) flagelliform, very delicate and slender, with few (3-4) or in very robust specimens, even 10–12 partial inflorescences and not terminated by a flagellum, but by a very slender filiform aculeolate appendix, which is a few cm. long, shorter and more slender than the nearest inflorescence; primary spathes very narrow and long and very strictly sheathing; the lowest slightly flattened, more or less acute at the side, almost unarmed, terminating in a very narrow acuminate limb keeled on the back; the upper cylindrical, more or less aculeolate throughout, very long-attenuate at the base, where the axis is reduced to a slender thread and is flat on one side and armed on the convex back with scattered or confluent, but not regularly half-whorled claws; partial inflorescences divaricate, horizontal or deflected by a very conspicuous axillary callus; they vary in length from 10 to 50 cm. and have the axis slender, straight or slightly sinuous, bear 2–7 spikelets on each side and terminate in a spikelet larger than the side ones; secondary spathes very narrowly tubular-infundibuliform, striately veined, smooth or aculeolate, obliquely truncate at the mouth, where usually but not always ciliolate, more or less prolonged at one side into an acute point; spikelets usually straight or slightly flexuous, inserted horizontally a few mm. above the mouth of their own spathe, slightly deflected by a distinct axillary callus, delicate, flattened, 3–5 cm. long or at most in very robust plants 8–10 cm. and with 10–20 up to 40–50 flowers on each side; spathels rather crowded, shortly and very broadly infundibuliform, rather strongly striately veined, produced at one side into a short acute point; involucre cupular, truncate, acutely bidentate and two-keeled on the side next to the axis, attached to the base of the spathel above its own. *Male flowers* inserted at an angle of 45°, rather variable, perfectly bifarious, the one close to the next or more or less distant, 3–4·5 mm. long, narrow, cylindrical or obsoletely trigonous, rather acute; calyx urceolate-campanulate, more or less distinctly striately veined, divided down to a little above the middle into three broad acute lobes; corolla about twice as long as the calyx or even longer, divided down almost to the base into 3 oblong acute segments; stamens very shortly united at the base, the filaments slender, filiform, subulate, much longer than their anthers, inflected at the apex; anthers versatile, narrowly sagittate, acute, their cells deeply discrete at the base; rudimentary ovary conspicuous, reaching about to the middle of the corolla, formed by a short pedicel (the ovary) and 3 linear connivent bodies (the stigmas). *Female spadix* very variable in size, filiform, very elongate and with very few partial inflorescences, otherwise very much the same as the male one; primary spathes as in the male spadix; partial inflorescences 17–20 cm. long in large specimens, or 5–6 cm. only in small ones, terminating in a small and short more or less developed slender appendix, horizontal or deflexed and with a conspicuous axillary callus, their axis more or less zig-zag sinuous with 2–4 remote distichous spikelets on each side; secondary spathes very narrowly tubular, slightly enlarged above, very closely sheathing, smooth or aculeolate, obliquely truncate and ciliate at the mouth, prolonged at one side into an acuminate point; spikelets 2–5 cm. long, inserted at the mouth of their own spathe by means of a large axillary callus, horizontal or deflexed, rigid, with zig-zag sinuous axes; the largest with 10–13, the smaller with 5–6 flowers on each side; spathels strongly striately veined, very broadly sub-infundibuliform when the flowers are rather remote, bracteiform and boat-shaped when approximate, always acute at one side; involucrophorum short, shallow, sub-cupular or almost explanate, attached laterally to the base of the spathel above its own; involucre shallow, irregularly cupular, strongly striately veined as is the involucrophorum and scarcely longer than it; areola of the neuter flower large, roundish, often deeply emarginate above, with acute and sharply defined margins. *Female flowers* almost horizontal, perfectly bifarious, not very remotely set, alternate, 3 mm. long, flat at the base, very slightly conical; calyx superficially striately veined, divided down almost to the middle into 3 very broad acute lobes; corolla twice as long as the calyx or a little less, divided down almost to the base into 3 lanceolate acute segments, polished outside; stamens almost equalling the corolla, with filaments united in the lower portion into a rather long tube, free, triangular and subulate upwards; anthers flattened, sagittate. *Ovary* columnar with the stigmas triangular, large and showing among the segments of the corolla. *Neuter flowers* large, thinner but scarcely shorter than the fertile ones, deciduous when these have been fertilized. *Fruiting perianth* sub-pedicelliform, somewhat hardened and callous at the base. *Fruit* globose or a little longer than broad, about 8 mm. in diam., topped by a cylindric 2·5 mm. long beak; scales in 18 series, light coloured, yellowish or greenish, flattish or slightly depressed in the centre, channelled along the middle, almost obtuse, with a pale erosely toothed margin and a faint intramarginal line, which is more distinct across the rather obtuse point. *Seed* sub-dimidiately globose, flattish and with a circular and rather deep chalazal fovea on the raphal side, roundish on the back, where the surface is obsoletely facetted, the facets plane or slightly concave; albumen equable; embryo almost basal or slightly sheathed towards the dorsal side.—The different parts of the plant when young are more or less covered with a rusty scurf, more permanent on the spikelets and flowers.

HABITAT.—The Malayan Peninsula, where it seems rather frequent. I have seen many specimens gathered in the district of Perak at an altitude of 100–260 m. above the level of the sea (Herb. Calc. No. 1996 (♀) and No. 2673 (♂) and No. 7932; also *Scortechini* No. 236 in Herb. Beccari).

OBSERVATIONS.—The typical form *peninsularis* of *C. javensis* must be considered that which, more than any other of the numerous forms of this species, resembles the Javan plant and which grows at no very great elevation above the level of the sea.

Probably the stem of this species acquires a great length, but being a species much sought for by the natives for its slender and valuable Rotang, only young plants which have not attained their full development are usually met with in the jungle.

It varies in the size of the stem, in the number and shape of the leaflets, in the length of the spadices, in the number of partial inflorescences, in the size and length of spikelets, and in the first (or lowest) pair of leaflets more or less deflexed and having a tendency to embrace the stem. A large and complete spadix which I measured was 2·5 m. long including 2 m. of peduncular portion, and with only 2 inflorescences, respectively 17 and 20 cm. long and bearing 4 spikelets on each side. Another much smaller spadix had only one inflorescence 5 cm. long and altogether had 5 small spikelets 15–20 mm. long.

The variety *peninsularis* differs from the Javan type in the leaflets which are not spinulous on the costæ, but mainly in the more roundish fruit which has fewer scales arranged in 18 instead of 20–21 longitudinal series.

Probably to *C. javensis* var. *peninsularis* must be reduced Roxburgh's *penicillatus* to which this author attributes the leaves with "thirty-four" pairs of leaflets; but the old botanists had not the habit of giving the exact number of the organs when these were very numerous, and very probably "thirty-four" is a misprint for "three or four," and if this be the case the description of *C. penicillatus* agrees pretty well with that of *C. javensis*.*

CALAMUS JAVENSIS var. PENINSULARIS, subvar. PURPURASCENS Becc. in Hook. f. Fl. Brit. Ind. vi, 443.

DESCRIPTION.—Much resembling in general habit and size the type *peninsularis*, and the var. *tetrastichus*. *Leaflets* broader than usual, the two basal strongly deflexed, embracing the stem and harbouring ants; sheaths moderately spiny. All parts, but specially the leaflets, conspicuously purpurascent.

HABITAT.—The Malayan Peninsula: Pulo Penang (*Curtis*); Perak (No. 7932 in Herb. Calcutta.)

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* Colonel Prain states that the manuscript of Roxburgh's diagnosis shows 3–4, not 34 leaflets. [*Editor.*]

CALAMUS JAVENSIS var. PENINSULARIS, subvar. PINANGIANUS Becc. in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—*Sheathed stem* 6 mm. in diam. *Leaf-sheaths* mottled with dark green and light patches and covered with numerous slightly deflexed spines of the usual form but with finer tip. *Leaf-sheath flagella* with the lowest spathe aculeolate on the back. *Leaves* with the petiole very short almost obsolete; rachis more strongly aculeate than in the type; leaflets usually more or less evidently clustered, rather narrow, lanceolate acuminate, 15–18 cm. long, 2·5–3 cm. broad, not spinulous on the carinæ; the two of the lowest pair inserted very near the mouth of the sheath, spreading (not deflexed). *Male spadix* very long, the one seen with 3 partial inflorescences, of which the lowest, the largest, has 3 spikelets on each side and one at the apex, which is longer than the side ones; the other inflorescence has 6 spikelets in all, and the uppermost only two. *Male flowers* 4 mm. long, cylindraceous, obtuse.

HABITAT.—Pulo Penang: collected by Mr. Curtis at an elevation of about 650 m. (Moniot's Rd.) in Jan. 1886.

OBSERVATIONS.—The characteristic notes of this variety are: the mottled densely spinous and apparently not striate leaf-sheaths; the narrow subclustered leaflets, of which the two of the basal pair are not deflexed and do not embrace the stem.

CALAMUS JAVENSIS var. TETRASTICHUS Bl. Rumphia iii, 62; Becc. in Rec. Bot. Surv. Ind. ii, 20)

C. tetrastichus Bl. Rumphia iii, t. 153; Mart. Hist. Nat. Palm. iii, 337; Walp. Ann. iii, 488 and v, 831; Miq. Fl. Ind. Bat. iii, 126, and De Palmis, 27 (with the var. *borneensis* Miq.); H. Wendl. in Kerch. Las Palm., 238.

C. amplectens Becc. Malesia ii, 78 and 278, pl. lxiv, f. 4.

C. borneensis Miq. Anal. Bot. Ind., 4 and Fl. Ind. Bat. iii, 126.

DESCRIPTION.—*Sheathed stem* 6–7 cm. in diam. *Leaf-sheaths* longitudinally striate, rather densely armed with straight, flattened, subulate, horizontal or slightly deflexed spines which are swollen at the base and scaly-barbed at the margins when young. *Ocrea* 8–15 mm. long, more or less woolly-furfuraceous and with long cilia at the margins when young, finally brittle and falling to pieces. *Leaflets* few, oblanceolate, suddenly acuminate into a long tip, distinctly 3-costate (the costæ and nerves naked on both surfaces), the two of the terminal pair connate for two-thirds of their length, the two basal usually quite deflexed, concave and embracing the stem. *Leaf-sheath flagella* with the lowest spathe aculeolate on the back or smooth. *Female spadix* with the primary spathes rather strongly aculeolate, especially at the apex; partial inflorescences with 3–4 spikelets, each 4–5 cm. long. *Fruiting perianth* almost entirely explanate under the fruit, its calyx subapiculate at the base. *Fruit* 12–13 mm. long (including the beak) ellipsoid-ovoid with rounded base and vertex, topped by a cylindraceous or obscurely trigonous beak, this 1·5 mm. long and bearing the persistent small reflexed stigmas. *Seed* 7·5–8 mm. long, with irregular rather concave facets.

HABITAT.—Borneo: in the southern parts of the Island on the River Batang Sengaleng (*Mueller* in Herb. Leyd.); Bandjarmassing (*Motley* in Herb. Kew); in the N. W. part, in Sarawak, at Kuching (*Beccari*).

OBSERVATIONS.—*C. tetrastichus* Bl. is certainly nothing more than the Bornean form of *C. javensis*, to which must also be reduced *C. amplectens* Becc. of Sarawak. Of *C. tetrastichus* I have seen in the Leyden Herbarium an authentic specimen entirely agreeing with plate 153 of Blume's *Rumphia*, except in the ocrea which is not so densely hispid as is represented in that plate. Motley's specimen is perfectly like Mueller's one.

That the flowers in the female spadix are arranged in four series is not a peculiarity of *C. javensis*. In all true *Calami* the female flowers are accompanied by a sterile or neuter one, and at a certain period of their development in many species the disposition in four series is very evident; but as the sterile flowers are very soon deciduous, then the fertile appear biseriate only. Miquel's *C. borneensis*, which afterwards by the same author was considered to be a variety of *C. tetrastichus*, has been founded on male specimens in no way differing from *C. javensis* var. *tetrastichus*.

Blume accorded some importance to the number of primary spathes sheathing the peduncular portion of the spadix; but the number of these, as well as that of the inflorescences, has very little value as a specific character; the differences depend chiefly on the conditions of more or less exuberant vegetation of the plant. From typical *C. javensis* of Java, the variety *tetrastichus* differs in the lowest or basal leaflets being quite deflexed, concave, completely enclosing the stem and forming an ant-harbouring receptacle; in the leaf-costæ never being spinulous; and in the more armed leaf-sheaths, where the spines have also a tendency to become hooked. The fruiting perianth is wholly explanate and not subpedicelliform as in the Javan form. In the fruit I have not found any important difference between the Javan and the Bornean plant, although perhaps the fruit of VAR. *tetrastichus* is slightly smaller but with an equally long beak. The seed also is the same.

From the Malayan forms of *C. javensis*, VAR. *tetrastichus* differs in the fruit having a shorter beak and in the seed having more concave facets.

PLATE 38.—Calamus javensis *var.* tetrastichus *Becc.* Portion of the leafy stem with a flagellum (the lower figure) from a Sarawak specimen, P. B. No. 1694 in Herb. Beccari.

CALAMUS JAVENSIS var. TENUISSIMUS Becc. in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—*Stem* excessively slender, 3·25–4 mm. in diam. with the sheaths on; naked canes 2 mm. only. *Leaf-sheaths* armed with small scattered slightly recurved prickles. *Ocrea* 10–12 mm. long. *Leaves* about 40 cm. in length; petiole 5–8 cm. long, roundish, sparsely aculeolate underneath, narrowly channelled above; leaflets very few, only 3 on each side, almost opposite (the couples rather inequidistantly remote), narrowly lanceolate or oblanceolate, about 2 cm. broad, the two terminal the longest (as much as 20 cm. long), connate to above the middle, the two lowest smaller than the others, spreading, not deflexed and not callous at their insertion. *Male spadix* 1–1·3m. long, with 3-4 partial inflorescences, each of which bears 8–10 spikelets. *Female spadix* exceedingly slender, filiform, the one seen about 60 cm. long with only one partial inflorescence, which bears 2–3 spikelets 15 mm. long, otherwise agreeing in the minute characters of the flowers and their involucres with those of the typical form, peduncular portion of the spadix sheathed by three spathes. *Fruiting perianth* almost entirely explanate under the fruit. *Fruit* ovoid-ellipsoid, more elongate and more conspicuously beaked than in the type, 1 cm. long without the 3 mm. long beak, and 7 mm. in diam.; scales in 15 series, almost flat or slightly concave, narrowly channelled along the middle, the margins pale, the tip marked by a transverse dark line. *Seed* more elongate than in the type, its facets slightly concave.

HABITAT.—The Malayan Peninsula, on the summit of Gunong Tambang Batak (*Scortechini* No. 648 ^{bis}.)—Malay name 'Rotang Pseh or Seh.'

OBSERVATIONS.—This seems to be the alpine form of *C. javensis* (form *peninsularis*), corresponding to the variety *exilis* of the Javan form. It differs from the type in the exceedingly slender stem; in the spines of the leaf-sheaths having a tendency to change into claws; in the small number and narrowness of the leaflets; and in the long-beaked elongate fruit.

PLATE 39.—Calamus javensis *var.* tenuissimus *Becc.* Portion of the plant with a leaf and an entire male spadix, from Scortechini's No. 236 ^{bis}. in Herb. Becc.; another portion of the plant with a fruiting spadix from Scortechini's No. 648 ^{bis}. in Herb. Beccari.

CALAMUS JAVENSIS var. SUBLAEVIS Becc.

DESCRIPTION.—*Sheathed stem* 7–8 mm. in diam. *Leaf-sheaths* green, almost polished, distinctly striate longitudinally, smooth or with very few short straight spines. *Leaves* 45–80 cm. long with a petiole sometimes very long (as much as 30 cm.); leaflets inequidistant, 4–6 on each side. *Ocrea* elongate, smooth, finally brittle and deciduous.

HABITAT.—Borneo; at Kutcing on Mt. Mattang (*Beccari* P. B. No. 1694).

OBSERVATIONS.—The very scantily armed or almost smooth leaf-sheaths distinguish this variety from *tetrastichus.* I have two leaves of it, the one with the petiole 5 cm. long, the other more than 30 cm., probably because the latter leaf belongs to a young shoot.

PLATE 40.—Calamus javensis *var.* sublævis *Becc.* Portion of the stem with a leaf (on the right-hand side) from P. B. No. 1694 in Herb. Beccari.

CALAMUS JAVENSIS var. POLYPHYLLUS Becc. in Hook. f. Fl. Brit. Ind vi, 443, and in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—*Stem* more robust than in the type. *Leaf-sheaths* rather densely covered with straight, horizontal, 5–6 mm. long spines. *Leaves* with relatively numerous leaflets (one leaf 55 cm. long had 10 leaflets on each side, and the two of the terminal pair highly connate) almost equidistant, lanceolate, the basal pair inserted very near the mouth of the sheath, and deflexed. *Male spadix* with many partial inflorescences; spikelets more numerous and nearly twice as long as in VAR. *peninsularis*, very slender, sometimes branched in the lower portion and with very many flowers. *Male flowers* 3 mm. long; secondary spathes now and then spinulous. *Female spadix* not seen.

HABITAT.—The Malayan Peninsula: on the summit of Gunong Tambang Batak in the district of Perak (*Scortechini* No. 651^b).—To this variety probably belong some incomplete specimens gathered by Sir G. King's collector between 700 and 1,000 m. at Larut, also in the district of Perak (Herb. Calc. No. 6312).

OBSERVATIONS.—Distinct from the Javan plant as well from the VAR. *peninsularis* (normal form) by its more robust habit and its numerous subequidistant leaflets.

The No. 6312 in the Calcutta Herbarium is more robust than Scortechini's specimens and has male spikelets more robust but not so long; the male flowers are also 4 mm. long, and the leaflets, at least in the portions of leaves I have seen, do not look exactly equidistant, though always more numerous than in the normal Javan form; the largest leaflets are 23 cm. long and 3 cm. broad or a little more. In Scortechini's specimens they vary from 15–17 cm. in length and are not more than 3 cm. broad.

PLATE 40.—Calamus javensis *var.* polyphyllus *Becc.* Portion of the stem with a leaf; a male spadix on the left-hand side of the plate, from Scortechini's specimen No. 651^b in Herb. Beccari.

CALAMUS JAVENSIS var. INTERMEDIUS Becc. in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—*Sheathed stem* 5–7 mm. in diam. *Leaf-sheaths* armed with many, small, short, straight spines. *Leaves* 40–50 cm. long with a petiole 2–5 cm. long and with 6–7 leaflets on each side, alternate or subopposite, not quite equidistant, lanceolate or oblanceolate, the mesial ones 15–17 cm. long and 2 cm. broad; the two of the terminal pair connate up to above the middle; the basal pair slightly smaller than the others, 2–5 cm. remote from the mouth of the leaf-sheath, not distinctly callous at their insertion on the rachis and not deflexed.

HABITAT.—The Malayan Peninsula, in the district of Perak (*Scortechini* No. 236).

OBSERVATIONS.—More slender than VAR. *polyphyllus* and with fewer leaflets; the stem is slightly larger than in VAR. *tenuissimus* and the leaves have more numerous leaflets.

PLATE 38.—Calamus javensis *var.* intermedius *Becc.* Portion of a leafy stem (upper figure) from Scortechini's No. 236 in Herb. Becc.

CALAMUS JAVENSIS var. ACICULARIS Becc.

DESCRIPTION.—Very slender. *Sheathed stem* 6 mm. in diam. *Leaf-sheaths* armed with scattered, short or rather long, straight, horizontal spines. *Ocrea* in very young shoots truncate and ciliated with long filaments at the mouth, finally deciduous.

Leaves short, on the whole 30–35 cm. long with very few (1–2) pairs of lanceolate or oblanceolate leaflets, the latter near the terminal pair; the lowest or basal pair transformed into two opposite, straight, flat, rigid, spreading, acicular spines, which are 3–3·5 cm. long and inserted very near the mouth of the sheath; the long vacant space of rachis between these spines and the leaflets has the appearance of a petiole and is densely furfuraceous and furnished with a very few straggling slender spines. *Female spadix* (small) shorter than the leaves, with very few partial inflorescences.

HABITAT.—Borneo in Sarawak on Mount Mattang at about 290 m. elevation: collected by (*Mr. R. H. Hullet* in 1890).

OBSERVATIONS.—Of this very curious variety of *C. javensis* I have seen only one specimen which was forwarded to me by Mr. H. N. Ridley. This variety is so unlike any other that I should have been much tempted to assign to it a distinct specific name had I not found among the numerous specimens in my possession an intermediate form between this VAR. *acicularis* and the usual *peninsularis*. In this intermediate specimen, collected by F. Keheding in 1879 at Klang in the Malay Peninsula, the spines at the base of the petiole are shorter, but have the same morphological value and are in the same place as in VAR. *acicularis*, and consequently the leaves appear as if furnished with a very long furfuraceous petiole and have 2–3 pairs of leaflets approximate to the two of the terminal pair.

PLATE 41.—Calamus javensis *var.* acicularis *Becc.* The entire specimen described above (Herb. Beccari).

32. CALAMUS FILIFORMIS Becc. Nelle Foreste di Borneo, 607, 608, and in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—Exceedingly slender and delicate. *Sheathed stem* 3–5 mm. in diam. *Leaf-sheaths* flagelliferous, sparingly armed with small, short, scattered, slightly hooked aculei or quite smooth. *Leaves* 25–40 cm. long; petiole very short or almost wanting; leaflets 5–6 on each side, somewhat inequidistant, alternate or subopposite, 3-costate, very narrowly lanceolate and very gradually attenuate at the base and acuminate at the apex, 8–12 cm. long, 8–14 mm. broad, the two of the terminal pair more or less highly connate at the base, the two of the basal pair deflexed and somewhat callous at their insertions. *Male spadix* . . . . . *Female spadix* filiform, very slender, with very few (1–3) partial inflorescences which are reduced to a single very slender spikelet 5–6 cm. long with 16–17 pectinate flowers on each side; spathels obtuse with few strong and distinct nerves; involucrophorum laterally attached at the base of the spathel above its own, strongly striately veined as is the involucre. *Female flowers* small, 2·5–3 mm. long; calyx callous at the base and divided down to about the middle into 3 broad acute lobes, indistinctly striately veined; corolla about twice as long as the calyx or somewhat less, divided almost to the base into 3 lanceolate, acute segments; filaments of the stamens connate by their bases and forming a membranous urceolum which is as long as the third part of the corolla and is crowned with 6 broad, ovate-lanceolate, subulate teeth; anthers deeply sagittate with obtuse apex.

HABITAT.—Borneo; on Mount Mattang, near Kuching in Sarawak (*Beccari* P. B. No. 1909.)—This species is represented in the Herbarium at Kew by a female flowering specimen collected by Lobb, very probably also in Sarawak. Native names in Sarawak 'Rotang Jangut,' 'R. Battu,' 'R. Kawat.'

It produces the most slender Rotang known to me. It is very tough and of very good quality, much employed by the natives for binding purposes, basket-making, etc.

OBSERVATIONS.—This is perhaps not so much a distinct species as an aberrant form of *C. javensis* closely related to VAR. *tenuissimus* from which, however, it differs in the infloresences being reduced to a single spikelet and in the more numerous and narrower leaflets, of which the upper pair are usually highly connate as in the different forms of *C. javensis*.

PLATE 42.—Calamus filiformis *Becc.* The upper part of a plant with a female spadix in flower and another intermediate portion, from P. B. No. 1909 in Herb. Beccari.

33. CALAMUS CORRUGATUS Becc. in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—Scandent; very long and slender. *Sheathed stem* 4–5 mm. in diam. *Leaf-sheaths* flagelliferous, obliquely truncate at the mouth, unarmed, but conspicuously marked by many approximate tranverse annular ridges or prominent wrinkles. *Ocrea* very short, more or less hairy-furfuraceous. *Leaf-sheath flagella* very slender, filiform, unamed in their basal portion and finely clawed upwards. *Leaves* short, 30–35 cm. long, not cirriferous; petiole very short (about 1 cm. long), hairy-furfuraceous; rachis also furfuraceous, slender, filiform, almost round, striate longitudinally, armed below with weak, solitary or ternate, semi-verticillate claws; leaflets very few (5 on each side), perfectly opposite, forming remote pairs, elliptic-lanceolate, narrowed to the base, where acute and slightly callous at their insertion, subulately acuminate at the apex, thinly papyraceous, about the same colour on both surfaces, plicate longitudinally and apparently many-nerved, but furnished with only three acute slender costæ (which are naked on both surfaces) and some slender secondary nerves; transverse veinlets sharp and rather approximate; margins acute, smooth; the largest leaflets, the mesial, horizontal, 12–13 cm. long, 2·5 cm. broad, the two of the terminal pair a little smaller than the side ones, united up to about their middle, the two near the base, the smallest, deflexed and callous at their insertion. *Spadices* not seen.

HABITAT.—Borneo; on Mount Mattang, near Kuching in Sarawak (*Beccari* P. B. No. 1910.)—There is a sterile specimen of this species in the Kew Herbarium collected by Lobb, probably also in Sarawak, in 1853.

OBSERVATIONS.—This is a very elegant and delicate species, which produces one of the smallest Rotangs of good quality. It is easily distinguished among those of the group of *C. javensis* by the ridged or wrinkled, not spinous, surface of the leaf-sheaths, and by the few, perfectly opposite and horizontal leaflets, which are approximate on each side of the rachis in remote pairs.

PLATE 43.—Calamus corrugatus *Becc.* The entire specimen, described above, of P. B. No. 1910 in Herb. Becc.

34. CALAMUS PAPUANUS Becc. Malesia, iii, 60, and in Rec. Bot. Surv. Ind. ii, 201. *Calamus sp.* No. 47., Becc. Malesia, i, 88.

DESCRIPTION.—Scandent, slender, very long. *Sheathed stem* 6–8 mm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, faintly striate longitudinally, fugaciously furfuraceous, sprinkled throughout with very small tuberculiform spines which point upwards, which are more numerous along the slightly raised longitudinal line that corresponds to the side where the flagella are inserted. *Leaf-sheath flagella* very slender, filiform, finely aculeolate throughout and distinctly callous at their insertion. *Leaves* short, about 30 cm. long, not cirriferous; petiole short (2 cm.), subtrigonous, aculeolate; rachis subtrigonous, obsoletely bifaced above, armed beneath with scattered claws; leaflets few (13 in all in the few leaves seen), inequidistant, clustered in about 4 remote fascicles of 3–4 each, generally disposed in opposite geminate divaricate pairs, the two near the base not opposite, spreading and not deflexed, the two of the terminal pair connate up to about their middle, all of about the same size and form, the largest 10–11 cm. long, 2·5 cm. broad, glabrous, papyraceous, rigidulous, of about the same colour on both surfaces, almost shining above, quite devoid of any kind of hairs, bristles or spinules, elliptic-lanceolate or ovate-elliptic or broadly oblanceolate, acute at the base, rather suddenly subulately acuminate into a naked and not bristly apex; furnished with 5 very slender costæ, of which the central is slightly stronger than the side ones, all naked on both surfaces, margins acute, smooth, transverse veinlets distinct, much interrupted.—Other parts unknown. All parts acquire a brown colour in drying.

HABITAT.—Dutch New Guinea; at Ramoi (*Beccari* P. P. No. 421).

OBSERVATIONS.—This seems related to *C. javensis.* The broad, grouped, opposite, divaricate leaflets quite hairless or spineless on the nerves, on the margins and at the apex, distinguish this species from any other of the group.

PLATE 44.—Calamus papuanus *Becc.* An intermediate portion of the adult plant from P. P. No. 421 in Herb. Becc.

35. CALAMUS FILIPENDULUS Becc. in Hook. f. Fl. Brit. Ind. vi, 443, and in Rec. Bot. Surv. Ind. ii, 202.

DESCRIPTION.—Scandent; rather slender. *Sheathed stem* 1–1·5 cm. in diam. *Leaf-sheaths* mottled when young, gibbous above, armed with scattered or slightly confluent, laminar, short and rather broad brown spines, which are 5–10 mm. long or even shorter and subtuberculiform, slightly deflexed, broad and concave beneath at the base. *Leaf-sheath flagella* filiform and very slender. *Leaves* not cirriferous, ·5–1 m. long, with a very variable petiolar portion (from 4 to 30 cm. in length), smooth or strongly aculeated, at the margins and on the back, flattish or superficially channelled above; rachis more or less armed, mainly along the middle, with scattered claws; leaflets very few (5–8 in all), large and broad, inequidistant (the two of the terminal pair not differing from the others, but confluent by their bases), glabrous, rather shining and of about the same colour on both surfaces, oblong or elongate-oblong, 25–40 cm. long and 5–10 cm. broad, gradually narrowing to the base, rather suddenly narrowed above into a short apex, furnished with 5–9 costæ which are devoid of bristles or spinules on both surfaces; margins naked and remotely spinulous near the apex; tranverse veinlets crowded, more distinct in the lower surface. *Male* and *female spadices* very similar, filiform, simply decompound, very slender, 1–1·8 m. long, differing from the leaf-sheath flagella only in the few remote partial inflorescences they bear; primary spathes very narrow and long and very closely sheathing, truncate at the mouth; the lowermost compressed, acutely two-edged, smooth or aculeolate on the outer surface; the upper cylindrical, finely clawed, longitudinally striated, not scabrid; partial inflorescences very narrow, divaricate, inserted far above the mouth of their own spathes, callous at their upper axilla, with 8–12 very short spikelets on each side; secondary spathes very scabrid or densely covered with very short tubercled spicules, tubular-cylindraceous, about 5 mm. long, truncate at the mouth and produced at one side into a triangular point which is deflexed under the spikelet. *Male spikelets* very short, 3–15 mm. long, horizontal, arched downwards, with 3–10 very approximate flowers on each side; spathels bracteiform, concave, very broad, strongly striately veined as is the involucre, which is shortly cupular with irregular margin. *Male flowers* small, oblong, obtuse, 2·5 mm. long; the calyx striately veined, broadly 3-toothed; the corolla also striate but polished, twice as long as the calyx; stamens with filiform filaments which are inflected at the apex; anthers linear; rudimentary ovary slender, columnar, terminated by 3 small recurved stigmas. *Female partial inflorescences* as the male ones, but somewhat more robust, with the lowest 3–4 spathels empty or without the usual spikelet; spikelets very short, 7–8 mm. long, inserted at the mouth of their own spathe; callous in their upper axilla, arched and deflexed, with very few approximate flowers; spathels bracteiform as in the male spikelets, with very few strong nerves converging to the apex; involucrophorum and involucre shallow, sub-cupular, strongly striately veined and with irregular margin; areola of the neuter flower rather large, ovate and almost two-winged at the sides. *Female flowers* larger than the males, 3·5 mm. long, conical-ovoid, acute; the calyx sub-urceolate, strongly and deeply striately veined and with three broad acute lobes; the corolla longer by one-third than the calyx, with lanceolate, acute segments. *Fruiting perianth* not pedicelliform. *Fruit* small, about 12 mm. long, broadly conically ovate, or from a broad base gradually narrowing into an acute and slender beak crowned by the recurved stigmas; scales shining, not or indistinctly channelled along the middle, yellowish, with a narrow often indistinct intramarginal dark line and a brown scarious and almost fringed tip. Seed irregularly globular, facetted on the back, with concave facets and a shallow broad chalazal fovea; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula, in the district of Perak (*Scortechini* No. 2312^{b} in Herb. Becc.; *King's Collector* Nos. 5659, 5773, 8019 in Herb. Calcutta).

OBSERVATIONS.—This is quite distinct amongst the species of the group by its leaves with large, long, broad and many-costate leaflets; by the scabrid secondary spathes; by the very short few-flowered spikelets and by the conic or obturbinate fruit.

PLATE 45.—Calamus filipendulus *Becc.* Leaf-sheath with the lower portion of a leaf and a male spadix; terminal portion of a leaf, portion of a female spadix with unripe fruits, from Scortechini's specimens No. 232^b in Herb. Beccari; two full grown fruits from the Calcutta Herbarium.

36 **CALAMUS GONOSPERMUS** Becc. in Rec. Bot. Surv. Ind. ii, 202.

DESCRIPTION.—Scandent. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* flagelliferous, armed with straight, horizontal or slightly deflexed spines, which arise from a very broad base (concave beneath) and are 5–15 mm. long. *Leaf-sheath flagella* very slender, finely armed with half-whorls of very sharp black-tipped claws. *Leaves* about 50 cm. long; petiole flattish above, rounded beneath, 17 cm. long, rather powerfully armed at the margins and on the back with unequal claws intermingled with very small ascendent or horizontal spines; rachis acutely bifaced above and furnished beneath with many irregularly set rather stout claws; leaflets very few, 6 in all, the two terminal connate about two-thirds up, two others very approximate to these and the two lowermost opposite and remote from the upper pairs; they are all about of the same size and shape (20–22 cm. in length, by 4·5–5·5 cm. in width), oblong or spathulate-oblong, somewhat concave or spoon-shaped, gradually narrowed to the base, suddenly contracted from near the apex into a caudate, linear, bristly-spinulous tip (2 cm. long); green and of about the same colour on both surfaces, glabrous, rigidulous, chartaceous, with 5 acute costæ which are quite naked on both surfaces; margins smooth, except at the sides of the tip, the lower one bordered on the upper surface with a polished band; transverse veinlets numerous and rather distinct. *Male spadix* . . . . . *Female spadix* short, comparatively robust, with very few short partial inflorescences, each with few, very short subscorpioid spikelets; primary spathes tubular, closely sheathing, thinly coriaceous, aculeolate, truncate and entire at the mouth; the lowest elongate, flattish on the inner side, dorsally convex, where irregularly armed with small, straight, unequal spines; secondary spathes tubular, cylindrical, closely sheathing, truncate at the mouth, aculeolate; spikelets (or abbreviated partial inflorescences ?) 3–5 cm. long, very dense, with 3–5 glomerules (abbreviate spikelets ?) of flowers on each side at each spathel, with the flowers pointing upwards or with a secund arrangement; spathels shortly tubular, subtrigonous, truncate at the mouth; involucrophorum and involucre almost explanate with an irregularly lobate limb. *Fruiting perianth* explanate, with the calyx divided into 3 broad acute lobes, and the corolla with the segments much narrower than these but as long; the calyx and corolla, as well as all the involucres, hard in texture, deeply and very sharply striately veined, of a rusty colour and with a broad shining, quite black, scarious margin. *Fruit* rather large, 20–23 mm. long, 15–17 mm. in diam., very closely packed, globose, ventricose, somewhat tapering towards the base, where obsoletely angular by mutual pressure, with a conical and acute top; scales in 16 series, broad, shining, very adpressedly imbricate, convex and not channelled along the middle, brown-yellowish near the base, broadly bordered with dark chestnut-brown, very obtuse or rounded at the apex and with an erose denticulate margin. *Seed* very irregularly globular and acutely angular, 10–12 mm. in diam.; chalazal fovea indistinct; albumen equable; embryo basilar.

HABITAT.—Borneo; near Kutcingat Siul, in Sarawak (*Beccari* P. B. No. 23).

OBSERVATIONS.—Of this very distinct species I have seen only one very incomplete specimen consisting of one leaf and a portion of a spadix as to which I am uncertain whether if it is simply decompound with very small partial inflorescences bearing very abbreviate spikelets, or if it is supradecompound with spikelets 3–4 cm. long and bearing few glomerulate flowers at each spathel. The main characters of this species are the leaflets with few, broad, 5-costulate leaflets; the very abbreviated spikelets with very closely packed secund flowers; the rather large fruit with a conical point and not furrowed scales, and the angular seed.

PLATE 46.—Calamus gonospermus *Becc.* The entire specimen in Herb. Beccari.

37. CALAMUS FLORIBUNDUS Griff. in Macl. Calc. Journ. v, 56 and Palms Brit. India, 66, pl. cxcvii; Mart. Hist. Nat. Palm., iii, 337; Walp; Ann. iii, 487 and v. 831; Hook. f. Fl. Brit. Ind. vi, p. 444. Becc. in Rec. Bot. Surv. Ind. ii, 204.

C. mishmeensis Griff. in Macl. Calc. Journ. v, 55 and Palms Brit. India, 65; Mart. Hist. Nat. Palm. iii, 337; Walp. Ann. v, 831.

C. multiflorus Mart. in Wallich's list No. 8613 (*see* Mart. l.c., p. 337, No. 506).

DESCRIPTION.—Gregarious, trailing at first, then not very high scandent, 3–6 m. long (*C. B. Clarke*). *Sheathed stem* 2–2·5 cm. in diam. or exceptionally smaller; naked canes 7–15 mm. in diam. with a polished surface. *Leaf-sheaths* sometimes flagelliferous, more or less gibbous above, very densely covered with spines of two kinds; some of them large, 2–3 cm. long, narrow, flat, subulate, horizontal or deflexed, scattered and solitary or more or less confluent and subseriate; others (by far the more numerous) much smaller and often reduced to sub-spiny bristles with a sub-bulbous base; all dark brown, at least at their apex, and with a light base. *Ocrea* with a short ovate liguliform limb, 10–15 mm. long and densely covered with brown rigid bristles. *Leaf-sheath flagella* elongate, irregularly armed with very unequal and sometimes long-tipped claws. *Leaves* comparatively short, usually ·6–1 m. in length, not cirriferous; petiole robust, channelled above in its first portion, flat upwards, rounded below, very irregularly armed at the margins with a few stout, straight, 1–4 cm. long, rigid, horizontal or deflexed spines, which are swollen or sub-bulbous at the base; in addition the petiole is rather densely covered throughout on both faces with small, short, straight spines, which are subulate from a broad conical base and sometimes reduced to small spiny tubercles; of this last kind of spine some appear also on the rachis, chiefly at the sides; rachis spinulous on the upper aspect (or sometimes smooth ?) where it is acutely bifaced in the upper, and obtusely in the first portion, remotely armed beneath (where flattish near the apex and rounded in the remainder) with a few stout and long spines which, like those of the petiole, are sub-bulbous at the base but suddenly deflexed and intermingled with scattered solitary small claws; leaflets few, very inequidistant, 6–10 on each side, or fewer in small specimens, and rather distant, but more or less distinctly approximate into 3 remote groups of 2–3 on each side; the leaflets of the terminal group (3–7) approximate and almost digitate, the two of the terminal pair highly connate by their bases; the largest, the mesial, as much as 50 cm. long and 3·5 cm. broad, narrowly lanceolate, acuminate at the apex, narrowed down from the middle to an acute base; the uppermost shorter, but not narrower and with a bristly-penicillate, but less acuminate apex; all are sub-shining above, slightly paler beneath, usually 3-costulate, but sometimes with an additional costa near each margin; all costæ (3 or 5) bristly spinulous above; beneath the mid-costa constantly and the side ones occasionally and sparingly bristly; margins rather closely ciliate, mainly near the apex, with spreading subspiny bristles; some of the leaflets, especially the uppermost, sometimes furnished on the upper surface on the mid-costa, near the base, with a few small spinules. *Male spadix* ultradecompound, flagelliform, 1·5–2·5 m. long, ending in a slender flagellum which is irregularly armed with weak claws but intermingled with straight deflexed or hooked spines; partial inflorescences not very numerous, rather remote, pyramidally paniculate, rather dense, 20–40 cm. long, and composed of 8–16 distichously alternate and gradually decreasing branches (or compound spikes) which are inserted just above the mouth of their respective spathes and are distinctly callous in their upper axilla; lowest primary spathe tubular, closely sheathing, acutely two-edged, armed with straight or variable spines or almost unarmed, more or less split longitudinally in the upper part and terminated by a lanceolate limb; upper primary spathes subcylindrical, closely sheathing at the base, slightly enlarged in the upper part, where often split longitudinally, acute or acuminate at the apex, more or less armed throughout, but chiefly at the base, with unequal scattered or aggregate claws of various sizes, which are often intermingled with small straight or tuberculiform spines; secondary spathes (spathes of the partial inflorescences) unarmed, tubular-infundibuliform, more or less furfuraceous and sprinkled with light or brown scales, truncate and entire at the mouth, where densely ciliate at the margin and prolonged at one side into an acute or subulate, ciliate or penicillate point; tertiary spathes similar to the secondary ones but smaller, somewhat angular, pubescent when young, narrowly tubular at the base and suddenly broadened into an acuminate ciliate limb; primary or compound spikes spreading and arched, the largest, the lowest, 15–25 cm. long, and with 10–12 spikelets on each side; these spikelets horizontally inserted at the mouth of their own spathe and gradually decreasing in length and number of flowers from the base upwards, the lowest, the largest, 2–3 cm. long, with 12–15 approximate flowers on each side, the uppermost very short and with very few flowers; spathels approximate, membranous, bracteiform, very broad, concave, pushed downwards by their respective flowers, prolonged into an acuminate tip, ciliate at the margins, finely striately veined; involucre laterally attached to the axis of the spikelet, subcupular, very obviously formed by two concave, ovate, acute, finely striately veined bracts which are united by their bases. *Male flowers* 3·5 mm. long, ovate, acute; the calyx rounded and almost smooth at the base, divided down beyond the middle into 3 ovate obsoletely striately veined acute lobes; the corolla twice as long as the calyx, its segments ovate-lanceolate, acuminate; the stamens with subulate filaments which are inflected at the apex in the bud; its anthers versatile, sagittate; the rudimentary ovary formed by three subulate rather elongate bodies. *Female spadix* as the male but simply decompound, with few remote partial inflorescences which are 15–30 cm. long, and with 4–8 spikelets on each side; primary and secondary spathes as in the male spadix, scaly-furfuraceous when young, ultimately subglabrous; spikelets vermicular, slightly arched, somewhat zig-zag sinuous between the flowers, the largest, the lowest, 8–12 cm. long, with 12–16 bifarious rather remote flowers on each side; spathels furfuraceous, very broadly infundibuliform from a narrow base, truncate and entire at the mouth and prolonged at one side into a short triangular tip; involucrophorum sub-cupular with an acute tooth on each side, almost exserted from its own spathel and laterally attached at the base of the one above with a distinct supra-axillary callus; involucre cupular, usually emarginate on the side of the neuter flower, of which the areola is sublunate, rather deep and relatively large. *Female flowers* 4 mm. long, conic-ovate, acute; the calyx deeply 3-lobed, not or indistinctly striately veined outside; the corolla with lanceolate, acute segments as long as the lobes of the calyx; the stamens with filaments forming an urceolate tube crowned by 6 short teeth; the abortive anthers sagittate. *Neuter flowers* very similar to the fertile ones, but soon deciduous and thinner, with vacuous anthers and an abortive ovary formed by 3 small acute bodies. *Fruiting perianth* explanate (not pedicelliform). *Fruit* almost sphæric (subobovate when immature), suddenly beaked, 9–10 mm. in diam.; scales in 15 series, obtuse, shining, superficially channelled along the middle, straw-yellow, bordered with a narrow brown-reddish line; margins finely erosely toothed. *Seed* suborbicular, rather convex, irregularly alveolate-sulcate on the back, with a deep circular chalazal fovea on the flattish raphal side; albumen equable; embryo basal.

HABITAT.—North-East India; Assam, Khasia Hills and Sylhet, (*Wallich* No. 8613), and (*Hooker f. & Thomson* in Herb. Kew). I have specimens from the Nambar Forest (*G. Mann*) and from the Charduar Forest (*Brandis*) in Assam; from the Khasia Hills (*C. B. Clarke*) at Sheelghat (100 m.), at Gowhatty (160 m.), and at Borlasa (1200 m.). It has been found also at the foot of the Mishmee mountains near Tapan Gam's village in fruit in November (*Griffith*).—It grows in the plains as well as on the hills, and it seems a rather common plant.

OBSERVATIONS.—A very variable plant in size, number of leaflets, and degree of armature of the different parts. It is very well characterised amongst the allied species by the few, grouped, relatively broad leaflets (with 3–5 costae, spinulous above) and by the radiate arrangement of those of the terminal group. The young leaves of very robust plants are larger than those described above and may be mistaken for those of *C. latifolius* Roxb., but this has leaflets with smooth not spinulous nerves.

Sometimes *C. floribundus* assumes very small dimensions, and seems almost a different species (see VAR. *depauperatus*).

PLATE 47.—Calamus floribundus *Griff.* Leaf-sheath with the basal portion of a female spadix in flower and upper part of a leaf (on the right hand side), from Mann's specimens in H. Becc.; portion of a male spadix and two leaflets from Gowhatty (C. B. Clarke in H. Becc.); summit of a fruit-spadix, from Borlasa (C. B. Clarke).

CALAMUS FLORIBUNDUS var. DEPAUPERATUS Becc.

DESCRIPTION.—Small, delicate, 1 m. high (*C. B. Clarke*). *Sheathed stem* very slender, 5–6 mm. in diam. *Leaf-sheaths* armed with very small, short and broad spines. *Ocrea* densely bristly-hispid. *Leaves* 35–40 cm. long with 6–8 leaflets (in all) in two groups; leaflets 15–20 cm. long, 15–22 mm. broad; those of the terminal pair more or less connate at the base; petiole and rachis armed with small scattered claws. *Male spadix* slender, flagelliform, almost simply decompound, with 2–3 small partial inflorescences.

HABITAT.—Gari at 400 m. in the Garo Hills in Assam, *C. B. Clarke* in H. Beccari.

OBSERVATIONS.—This variety at first sight appears very distinct from the type, and recalls some of the forms of *C. javensis*.

PLATE 48.—Calamus floribundus *var.* depauperatus *Becc.* C. B. Clarke's entire specimen in H. Becc.

38. CALAMUS INTERRUPTUS Becc. Malesia iii, 60 and Rec. Bot. Surv. Ind. ii, 204.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* 15–20 mm. in diam. *Leaf-sheaths* cylindrical, almost glaucescent, fugaciously furfuraceous, slightly gibbous above, very obliquely truncate at the mouth, gradually passing into the petiole, armed with a few strong, scattered, solitary or sometimes confluent, deflexed, flattened and straight and subulate 15–20 mm. long spines, which have a broad base concave beneath. *Ocrea* small, glabrous, liguliform and membranous, narrowly bordering the margins of the base of the petiole and the mouth of the sheath. *Leaf-sheath flagella* very long and robust, flattened and acutely two-edged in their lower portion where they are spinulose-serrulate or furnished with small ascendent prickles at the sides, terete above and strongly armed with scattered or aggregate or half-whorled claws. *Leaves* not cirriferous, 1·5 m. long; the petiole rather long (25–35 cm.) very broad at the base, where deeply channelled above and with acute membranous naked margins, rounded and unarmed beneath in its first portion; higher up flat and smooth above, and armed irregularly beneath along the middle and at the sides, like the first portion of the rachis, with rather robust and scattered claws; the rachis bifaced and smooth above, and armed rather densely beneath, mainly in the upper portion, with strong, solitary, or more or less confluent, black-tipped claws; the leaflets not numerous, about 15 on each side, irregularly approximate into 4–5 distant fascicles of 2–3 on each side, elongate-lanceolate, gradually narrowed to an acute base, acuminate at the apex into a subulate, naked or very sparingly bristly tip, 25–35 cm. long, 2·5–3 cm. broad, papyraceous, rather firm, brown when dry, shining above, of the same colour on both surfaces, perfectly glabrous, their mid-costa acute above, and with 2–3 secondary nerves on each side of it, naked on both surfaces; transverse veinlets sharp, much interrupted, margins acute, smooth; the two leaflets of the terminal pair somewhat shorter than the others and confluent by their bases.—Other parts unknown. The leaves acquire a dark brown colour on drying.

HABITAT.—N.-W. New Guinea; at Ramoi, *Beccari* P. P. No. 420.

OBSERVATIONS.—Distinguished amongst the Papuan species by the cylindrical, smooth or sparingly spinous leaf-sheaths, which gradually pass into the petiole, and by the leaflets which are not numerous, narrowly lanceolate with only the mid-costa acute and 2–3 secondary nerves on each side of it quite smooth (also at the margin), and approximate into 4–5 distant groups.

PLATE 49.—Calamus interruptus *Becc.* Portion of the sheathed stem with an entire flagellum and the base of a leaf; and intermediate portion of a leaf seen from the under surface (on the left lower corner); the apex of the same leaf, from P. P. No. 420.

CALAMUS INTERRUPTUS var. DOCILIS Becc. Malesia ii, 60.

C. docilis Becc. in Rec. Bot. Surv. Ind. ii, 204.

DESCRIPTION.—It differs from the type only in the quite unarmed leaf-sheaths.

HABITAT.—North-Western New Guinea; at Ramoi, with the type *Beccari* P. P. No. 418.

PLATE 50.—Calamus interruptus *Var.* docilis *Becc.* Portion of the sheathed stem with an entire flagellum; an intermediate portion of a leaf (upper surface); the apex of the same leaf, from P. P. No. 418 in Herb. Becc.

39. CALAMUS DIOICUS Lour. Fl. Cochinchin. i, 210; edit. Willd. i, 262; Lam Encycl. vi, 366; Roem. et Schult. Syst. Veg. vii, II. 1322; Mart. Hist. Nat. Palm. iii, edit. I. 213 and p. 342; Kunth Enum. Pl. iii, 213; Walp. Ann. iii, 491 and v, 832; H. Wendl. in Kerch. Les Palm., 236.; Becc. in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—Very slender, scandent. *Sheathed stem* 4–5 mm. in diam.; naked canes 2·5 mm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, hispid or bristly near the mouth and densely covered with very unequal, slender, straight, slightly deflexed spines which are 1–5 mm. long and rest on a broad base. *Ocrea* 15–20 mm. long, dry, membranous, bristly-spinulous on the ventral side, later lacerated and deciduous. *Leaf-sheath flagella* very slender, filiform, with a large axillary callus at the base, and with the lowest spathe flattened and spinulous, terete upwards and very finely clawed all round. *Leaves* short, 25–40 cm. long, not cirriferous, petiole very short or almost obsolete; rachis trigonous, clawed throughout beneath leaf-sheaths, petiole and rachis fugaciously covered with very dark scurf; leaflets very inequidistant, more or less distinctly grouped, 8–11 in all, of which 4 are very approximate at the summit with the two terminal free at the base and other 4 inserted very near the mouth of the sheath and kept in a divergent or deflexed position by a distinct basal callus; the intermediate ones opposite when there are 2; if 3, one straggling; all are very narrowly lanceolate, 10—20 cm. long, 11–15 mm. broad, narrowing to the base and acuminate to a bristly-penicillate apex; very finely 3- or sub-5-costulate; the costæ acute and all more or less bristly-spinulous above, the mid-costa scarcely more distinct than the side ones, beneath all superficial and smooth; secondary nerves very faint; transverse veinlets much interrupted and not very crowded; margins finely and appressedly spinulous, sometimes bordered by a polished band. *Male spadix* . . . . . *Female spadix* very slender, filiform, 40 cm. long, with a large polished callus at its insertion and terminating in a filiform flagellum which is finely aculeolate all round; partial inflorescences very few, only two in one specimen and of these the lowest 12 cm. long, with 9 spikelets in all; primary spathes elongate, very narrowly tubular, closely sheathing, truncate at the mouth, fugaciously covered with blackish scales and densely armed all round with very small and very acute black-tipped claws; secondary spathes tubular-subclavate, attenuated a good deal at the base, where they are flat onthe inner side truncate at the mouth, obtusely apiculate at one side, smooth or armed with a few short claws; spikelets alternate, distichous, straight, filiform, horizontal or slightly deflexed, 2–4 cm. long, attached above the mouth of their own spathe, and with a distinct axillary callus; spathels tubular-infundibuliform, truncate at the mouth, indistinctly striately veined; involucrophorum shallow, sub-cupular, laterally attached to the base of the spathel above its own; involucre sub-cupular with unequal margin; areola of the neuter flower lunate with acute borders. *Female flowers* small, 2·5 mm. long. *Fruiting perianth* distinctly pedicelliform; the calyx glabrous, smooth, not striately veined, hardened and depressedly ventricose at the base, divided down almost to the middle into 3 broad apiculate lobes; the corolla divided into 3 ovate, acute, smooth segments, which are longer by one-third than the calyx; stamens forming with the united bases of the filaments an urceolum which is as long as the calyx and is crowned by 6 triangular lanceolate, subulate teeth. *Fruiting perianth* pedicelliform. *Fruit* globular or a trifle longer than broad, 5 mm. long by 8–8·5 mm. in width and further topped by a cylindric beak 1·5 mm. long; scales subshining, but very finely scabridulous under a strong lens, almost flat, faintly channelled along the middle, broader than long, with an intramarginal light line and further bordered by another line of a chestnut-brown colour, their tips slightly prolonged and appressed, their margins almost entire. *Seed* irregularly globular, slightly compressed, 6 mm. long, coarsely alveolate; chalazal fovea roundish, shallow; albumen equable; embryo basal.

HABITAT.—Cochin-China, *Loureiro*. Rediscovered by Pierre in February 1879 on the Chiao-Xhoin mountains.—Native name in Moi language "Rani," in Annamite "May Sap," (*Pierre* No. 4834).

OBSERVATIONS.—Notwithstanding the very defective description of *Calamus dioicus* left by Loureiro, many considerations have induced me to identify with this species the specimens of Pierre described above. *C. dioicus* is related to *C. javensis*, which it resembles in the slenderness, length and toughness of the stem. It is, however, distinguished by the leaflets having 3–5 slender costæ which are bristly-spinulous above and by the fruiting perianth being distinctly pedicelliform.

PLATE 51.—Calamus dioicus *Lour.* Portion of the plant with a fruit spadix from Pierre's No. 4834.

40. CALAMUS SCHISTOACANTHUS Bl. Rumphia iii, 49; Mart. Hist. Nat. Palm. iii, 936; Walp. Ann. iii, 406 and 830; Miq. Fl. Ind. Bat. iii, 122, and in Journ. Bot. Neerl. i p. 21, and De Palm. Arc. Ind. 27; Wendl. in Kerch. Les Palm. 237; Becc. in Rec. Bot. Surv. Ind. ii, 201.

DESCRIPTION.—Slender, scandent, as thick as a man's little finger at most. *Leaf-sheaths* obliquely truncate at the mouth, fugaciously tomentose, densely armed with very unequal spreading straight subulate spines, which are short or 2–3 cm. long, swollen and light-coloured above at the base, otherwise glossy, and of a leaden schistaceous colour. *Leaf-sheath flagella* slender, filiform, armed with small solitary or half-whorled claws. *Leaves* rather short (40–60 cm. long) not cirriferous; petiole short or almost obsolete, channelled above, rounded on the back, armed at the sides with some straight, 5–10 mm. long, spreading conical subulate dark-tipped spines; rachis dotted with brown deciduous scales, bifaced above, rounded beneath, where irregularly armed with small scattered solitary geminate or ternate black-tipped claws; leaflets not many, 12–13 on the whole, of which 4 somewhat more remote than the others and approximate at the apex, of these the two terminal entirely free at the base; those of the basal pair opposite; the intermediate ones irregularly and remotely alternate; they vary from 15 to 30 cm. in length and 10–12 mm. in breadth and are narrow, linear-ensiform and attenuate at the base, acuminate and bristly-penicillate at the apex, almost papyraceous, rigidulous, glabrous and about the same colour on both surfaces, but sprinkled beneath with small scales which are visible under a lens, furnished with an acute mid-costa and 1–2 fine weaker nerves on each side of it—all naked on both surfaces; margins somewhat thickened by a slender nerve running alongside and appressedly bristly-ciliate only near the apex and smooth at the base; transverse veinlets sharp, rather remote and much interrupted. Other parts unknown.

HABITAT.—Sumatra, *Praetorius;* also in Borneo on the River Dussoon, *Korthals* according to Blume.

OBSERVATIONS.—Very imperfectly known. Blume says that the specimens from Sumatra agree with those from Borneo, and that only the leaves and leaflets of the first are more robust; nevertheless I entertain some doubt about the Bornee specimens, and I consider as typical those of Praetorius from Sumatra, of which I have seen one, kindly sent to me from the Leyden Herbarium. In this specimen the sheathed stem is 7–8 mm. in diameter; the leaves are almost without a petiole and bear five very narrow leaflets on each side with other four approximate at the top as described above. *C. schistoacanthus* seems related to *C. javensis;* but its true affinities in the absence of the spadices remain uncertain.

PLATE 52.—Calamus schistoacanthus *Bl.* The entire type-specimen of Praetorius, from Sumatra, in the Leyden Herbarium.

41. CALAMUS KINGIANUS Becc. sp. n.

DESCRIPTION.—Slender, probably scandent. *Sheathed stem* 10–12 mm. in diam. *Leaf-sheaths* cylindrical, strongly gibbous above, covered with a thin ashy-brown scurfy-crustaceous indumentum, very densely armed with rather short unequal slender laminar horizontal spines, which often form short interrupted very approximate and sometimes crested ridges. *Ocrea* inconspicuous. *Leaves* not cirriferous, 70 cm. long on the whole; petiole 16 cm. long in one leaf, slightly channelled near the base and otherwise flat and naked above, sparingly armed at the sides and along the middle beneath with small solitary claws; rachis acutely bifaced above, rather convex beneath, where armed scantily and irregularly with scattered and solitary or 2–3-nate claws; leaflets very few, very inequidistant, approximate into a few remote fascicles of very few leaflets each; 4 leaflets are grouped at the apex, digitate and free at the base; they are all almost of the same size and shape, 25–26 cm. long, 3 cm. broad, lanceolate, almost equally tapering towards both ends, with an acute bristly penicillate apex, green even when dry, dull and almost of the same colour on both surfaces, papyraceous, rather rigid, distinctly and acutely 3-costate, with another rather distinct nerve near each margin and therefore sub-5-costate, the 3 larger costæ on the upper surface spinulous from the middle upwards; beneath all the nerves more slender and naked; margins finely and appressedly spinulous near the base, more spreadingly spinulose towards the apex; transverse veinlets more distinct on the lower surface than on the upper. *Male spadix* not very large and rather rigid, simply decompound (not seen entire); lowest primary spathe tubular, elongate, closely sheathing, flattened, two-edged, armed at the sides with horizontal straight spines and, especially in its basal portion, with small often hooked prickles, obliquely truncate at the mouth, being prolonged at one side into a rather short obtuse point; attenuated axial portion between two partial inflorescences flat towards the base on the inner side, and convex on the back, where rather densely armed with unequal scattered solitary claws; partial inflorescences (only one seen and it the lowest) attached with a distinct axillary callus and transverse rima above the mouth of its spathe, 25 cm. long with 4–5 spikelets on each side and with a terminal spikelet larger than the side ones; secondary spathes tubular, slightly infundibuliform, closely sheathing, unarmed, flattish on the inner side near the base, obliquely truncate, entire and naked at the mouth, where slightly prolonged at one side into a short point; spikelets attached outside their own spathe with a distinct callus and axillary rima, horizontal or arched downwards, slender, elongate; the lowest, the largest, 8–9 cm. in length with 20–22 flowers on each side, the upper ones gradually shorter; spathels asymmetrically infundibuliform, finely striately veined, truncate, entire and naked at the mouth, prolonged at one side into a triangular sometimes cleft rather acute point; involucre dimidiately cupular, attached to the base of the spathel above its own, acutely two-keeled and bi-dentate and with the margin deeply excavated on the side next to the axis. *Male flowers* rather remote, ovate-lanceolate, acute, about 5 mm. long; the calyx cylindraceous, obscurely striately veined, with 3 broad triangular acute lobes which form a third part of the length of the entire calyx; corolla about twice as long as the calyx with narrow acute externally polished segments.—Other parts unknown.

HABITAT.—North-East India: found by Sir G. King's collectors in Assam at an elevation of about 500 m. in February 1893 (Herb. Calc.).

OBSERVATIONS.—Of this I have seen only one specimen of the stem with leaf and the basal portion of a male spadix; this probably was flagelliferous at its apex. It seems allied to *C. floribundus*, from which it differs in the more distinctly grouped leaflets and in the much longer male spikelets with remote flowers; but its true affinities are somewhat uncertain in the absence of the female spadix and fruit.

The main characters of *C. Kingianus* are the short leaves with a relatively long petiole; the very few lanceolate leaflets, which are distinctly fascicled, 3- or sub-5 costate; the two terminal free at the base; the male spadix with partial inflorescences terminating in a spikelet longer than the side ones which are elongate with many distant flowers.

PLATE 53.—Calamus Kingianus *Becc.* The entire type-specimen in Herb. Calc.

42. CALAMUS MUELLERII H. Wendl. in lett. to F. v. Muell; H. Wendl. & Drude in Linnæa, xxxix. (1875), 193, pl. ii, f. 1-8; H. Wendl. in Kerch. Les Palm. 237; Benth. Fl. Austr. vii, 134; F. v. Muell. Census Austr. Pl. 119; Becc. Malesia i, 88, and in Rec. Bot. Surv. Ind. ii, 202; Bailey in Queensl. Fl. 1686.

C. australis (not of Mart.) F. v. Mueller Fragm. Phyt. Austr. v, 49 (fide Wendl. & Drude l. c.).

DESCRIPTION.—Scandent, slender. *Sheathed stem* 6–8 mm. in diam. *Leaf-sheaths* flagelliferous, not gibbous above, rusty-furfuraceous, entirely covered with ascendent or spreading chestnut-brown (ultimately deciduous?) bristles, which are 6–7 mm. long at most, and become closer, longer and erect near the mouth of the sheath. *Ocrea* very short (a few mm. long) horizontally truncate, very densely bristly-spinulous like the leaf-sheaths. *Leaf-sheath flagella* filiform, rather rigid, armed with very slender scattered claws. *Leaves* not cirriferous, short (about 30 cm. long); petiole almost obsolete or very short, trigonous, bristly-spinulous at the sides, but chiefly underneath; rachis rather densely furfuraceous like the petiole, trigonous, bifaced and acute above, flattish underneath, where sparsely and irregularly armed at the sides and along the middle with slender scattered recurved spines, which change towards the summit into small claws; leaflets few (11–14 in all) very irregularly set, lanceolate or linear-lanceolate, almost equally attenuate to both ends, acute at the base, subulately acuminate at the apex, thinly papyraceous, about the same colour on both surfaces, almost shining, 3-sub-5-costulate, the mid-costa slightly stronger than the side ones, all naked on both surfaces or sometimes the mid-costa furnished near the base on the upper surface with a few (1–4) pale, weak, 5–7 mm. long spiculæ; transverse veinlets rather sharp and approximate; margins ciliated with small remote spreading spinules; the largest leaflets, the mesial, 18–20 cm. long and 16–24 mm. broad, 3–4 of those nearer the base usually approximate and inserted very near to the sheath; the 4 uppermost also approximate and the two terminal free or more or less connate at the base. *Male spadix* . . . . . *Female spadix* supradecompound, elongate, flagelliform, very slender, with very few, remote partial inflorescences; primary spathes very elongate, tubular, very closely sheathing, rather densely aculeolate, bristly at the mouth; the lowermost slightly compressed, the others cylindraceous; partial inflorescences furnished with a filiform flattened peduncular portion, the largest among them (the lowest) 10–15 cm. long with 6–7 spikelets on each side; secondary spathes very closely sheathing, tubular, slightly enlarged above, subtrigonous, smooth or aculeolate in their upper part, truncate and ciliolate at the mouth, where acute at one side; spikelets inserted above the mouth of their own spathe, with a very distinct axillary callus; the largest (the lowest) 3–6 cm. long, with 8–12 flowers on each side; the appermost much shorter and with fewer flowers; spathes broadly infundibuliform, striately veined, truncate and subciliolate at the mouth, apiculate at one side; involucrophorum inserted at the base of the spathel above its own and with a distinct axillary callus, cupular, truncate and ultimately split; involucre cupular, often asymmetrically evolute; areola of the neuter flower rather large, slightly concave with acute borders. *Flowers* horizontally set. *Fruiting perianth* explanate, its calyx rather coriaceous, at first 3-toothed, later entirely split into 3 parts; corolla divided into 3 ovate-lanceolate thinly coriaceous segments one-third longer than the calyx; filaments of the stamens forming an urceolate cup which reaches to the middle of the corolla and is crowned by 6 triangular teeth. *Fruit* broadly obovate or subglobose, about 15 mm. long and 12 mm. broad, rounded at both ends, but topped by a short beak; scales in 18 series, dull dirty-yellowish, very faintly channelled along the middle and with a very narrow dark-brown intramarginal line margins pale, scarious; tip short, triangular, erose-denticulate. *Seed* irregularly globose, 9 mm. in the largest diam. with a minutely rugulose testa and with a rather deep chalazal fovea about the centre on the raphal side; albumen horny, equable; embryo basal.

HABITAT.—Australia: in Queensland, on the Brisbane River and in Moreton Bay, (*Wendl. & Drude*); at Laguna Bay, where it is said to be common in certain places in the damp forest, *Diels* No. 8230 in Herb. Berol.; Pine River, *Hill & Mueller* in Herb. Kew. In New South Wales on the Richmond River, *Henderson* in Herb. Kew; on the Clarence River, *F. v. Mueller* in Herb. Beccari.

OBSERVATIONS.—This seems a rather variable plant. The basal portion of a leaf from the Clarence River specimen has the petiole very short and the rachis densely furfuraceous, furnished with deflexed hooked spinules and with rigid subspiny bristles; the basal leaflets (4 in number) are approximate, very narrow, subulately acuminate, 11–20 cm. long, 12 mm. broad, and bear on their mid-costa 1-4 needle-like, slender, straight, erect, 4–7 mm. long spines. The specimen from Pine River has a leaf 30 cm. long with 11 leaflets which are devoid of spines on the mid-costa. In the specimen from Laguna Bay the leaflets are larger than in the above mentioned and only occasionally a straggling spinule may be seen on their mid-costa. The fruit I have described is from the specimen collected by Henderson on the Richmond River.

PLATE 54.—Calamus Muellerii *Wendl.* An intermediate portion of the stem with two entire leaves and the upper portion of a spadix with very young fruit; from Diels's No. 8230 in Herb. Berol.

PLATE 55.—Calamus Muellerii *H. Wendl.* The basal portion of a leaf with 4 leaflets, the spadix and two fruits in the lower right-hand corner, from the Clarence River specimen in Herb. Becc.; the partial inflorescence with full-grown fruit and the seeds, one entire and the two halves of one longitudinally cut through the embryo, from the specimen from Richmond River in Herb. Kew: the entire leaf from the Pine River specimen in Herb. Kew.

CALAMUS MUELLERII var. MACROSPERMUS Wendl. & Drude in Linnæa, xxxix. (1875), 194, pl. II, f. 1, 9–11.

OBSERVATIONS.—I have not seen a specimen of this variety, of which no special locality is given by its authors, but the dimensions of the fruit assigned by them exactly agree with those I have registered above. However it must be remembered that the fruit of *Calamus* is somewhat variable in size according to its degree of maturity.

43. Calamus caryotoides All. Cunn. in Mart. Hist. Nat. Palm. iii, 212 (1st edit.) and 338; Kunth. Enum. Pl. iii, 212; Walp. Ann. iii, 489 and v, 831; H. Wendl. & Drude in Linnæa, xxxix, 195; Wendl. in Kerck. Les Palm. 235; Becc. Malesia. i, 88 and ii, 77; Benth. Fl. Austr. vii, 135; F. v. Muell. Census Austr. Pl. 119; Becc. in Rec. Bot Surv. Ind. ii, 202; Bailey, Queensl. Fl. 1686.

Description.—Slender, scandent. *Sheathed stem* 5–8 mm. in diam. *Leaf-sheath* gibbous above, finely striate longitudinally, furfuraceous in youth, later glabrous, densely covered with rigid hairs like deciduous spiculæ, which afterwards leave a sub-spiny tubercled base. *Ocrea* 5–6 mm. long, almost horizontally truncate, densely hispid. *Leaf-sheath| flagella* slender, filiform, very finely aculeolate. *Leaves* short, 25–40 cm. long, not cirriferous; petiole almost obsolete or very short and thick with a distinct swelling or callus at its axilla; rachis subtrigonous, bifaced above, armed irregularly, chiefly on the lower surface, with very small claws and often sprinkled with black-tipped sub-spiny tubercles; leaflets very few (6–9 in all) very inequidistant, rigidulous papyraceous, rather shiny above, slightly paler beneath; the two of the terminal pair are more or less united (sometimes almost to the apex) and form a broad, furcate flabellum which is cuneate at the base and has the terminal margin truncate, sinuous and præmorse; side-leaflets alternate, oblong-spathulate or more usually elongate-cuneate, |gradually narrowing towards the base from near the apex, which is also irregularly truncate and præmorse; the largest (the mesial) 15–18 cm. long, 3–4 cm. broad; the lowest approximate, narrower and shorter, usually divergent or even deflexed, all furnished with 5–7 slender costæ diverging from the base; costæ smooth on both surfaces, the central hardly stronger than the side ones, and all reaching the apex; transverse veinlets sharp, approximate and quite continuous; margins acute, more or less furnished with small and remote spinules. *Male* and *female spadices* almost the same and simply decompound, inserted almost opposite the leaf near the mouth of the sheath with a distinct axillary callus, very slender, flagelliform, and terminating in a filiform aculeolate appendix; primary spathes very narrowly tubular, very long, and very closely sheathing, sparsely aculeolate, the lowest slightly flattened the others cylindrical, obliquely truncate at the mouth; axial portion between two partial inflorescences very slender and armed externally with small claws. *Male spadix* 1–1·2 m. long, with 6–7 partial inflorescences, nodding, inserted inside their own spathes; the largest, the lowest, as much as 15 cm. long with 8–9 spikelets on each side; the others gradually smaller; the upper most reduced to a few spikelets; secondary spathes tubular–infundibuliform, closely sheathing, unarmed, obliquely truncate and with paleaceous cilia at the mouth; spathels shortly tubular at the base, suddenly enlarged into a concave limb, striately veined and prolonged at one side into a spreading acute point; involucre almost entirely exserted from its own spathel and attached to the base of the one above, cupular, truncate, almost entire or slightly bi-dentate and bi-carinate on the side next to the axis. *Male flowers* narrowly oblong, 4 mm. in length; the calyx strongly striately veined, tubular, with 3 short very broad teeth; segments of the corolla shining and smooth externally, twice as long as the calyx. *Female spadix* somewhat shorter than the male one, 60–80 cm. long, with 4–5 partial inflorescences which are short and broad, the largest (the lowest) 6–7 cm. long, with 6–7 spikelets on each side; secondary spathes as in the male spadix; spikelets slightly arched, horizontal or somewhat deflexed, attached just at the mouth of their own spathe with a distinct axillary callus, 2–3 cm. long, and with 6–10 flowers on each side; spathels shortly tubular at the base, suddenly enlarged into a spreading broad concave limb, acute at one side; involucrophorum concave, with a short limb, inserted laterally almost entirely outside its own spathel, at the base of the one above; involucre cupular, entire; areola of the neuter flower lunate, relatively large and sharply bordered. *Female flowers* ovoid, about 3 mm. long, horizontally attached; the calyx strongly striately veined with 3 broad acute lobes; corolla with acute and polished segments one-third longer than the calyx. *Neuter flowers* slightly smaller than the fertile ones. *Fruiting perianth* not pedicelliform. *Fruit* very broadly ovate or subsphæric, rounded at both ends, but topped by a short beak, 12–13 mm. long (including the beak), 9–10 mm. broad; scales in 18 series, dirty yellowish, not very shining, superficially channelled along the middle, with a narrow dark-brown intramarginal line and scarious erosely toothed margins and tip. *Seed* irregularly globose, with rather smooth surface, very convex on the back and with a slightly depressed chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—Australia: Queensland; Endeavour River, *Allan Cunningham* as from Martius; Bloomfield River, Rockingham Bay, *Daliachy* in Herb. Becc. from F. v. Mueller; Russell River, *W. A. Sayer* in H. Becc. from F. v. Mueller; Cairns at Kamerunga, *Warburg* No. 19504 in Herb. Berol.; Mt. Cook near Cooktown and Cairns, *L. Diels* No. 8293, 8480 in Herb. Beccari.

OBSERVATION.—This is a very characteristic species, easily distinguished from any other, so far as we know at present, by its short leaves with few irregularly truncate and præmorse leaflets which resembles those of some species of *Ptychosperma*.

PLATE 56.—Calamus caryotoides *All. Cunn.* An intermediate portion of the plant with a spadix bearing ripe fruit; an entire female spadix with very young fruit; the apex of another spadix with female flowers; seeds.—From Warburg's specimens No. 19504 in Herb. Berol.

44. CALAMUS VIMINALIS Willd. Sp. Pl. ii, (1799), 203 (not of Reinw. in Mart.): Lam. Enc. Bot. vi, 306; Rees, Cyclop. No. 9; Roem. & Schult. Syst. Veg. vii, 2ª, 1328 (excl. all cit. except Herb. Amboin. pl. 55, f. 2, A. B.); Nees v. Esenbeck Plant. Off. t. A. B. (ex. Mart.) Blume Rumphia iii, 45 excl. *C. viminalis β prostratus* Bl. and excl. *C. viminalis β amplus* Mart. (this is reduced by Mart. himself, l. c., p. 336, under *C. buroënsis*, to *C. Reinwardtii*); Mart. Hist. Nat. Palm. iii, 205 (1st edit.), only as to the plate in the Herb. Amb. and p. 336 under *C. buroënsis*; Becc. in Rec. Bot. Surv. Ind. ii, 203.

C. Rotang var. E Linn., Sp. Pl., 2nd edit., p. 463 (partly).

C. buroënsis Mart. Hist. Nat. Palm. iii, 336, as to the plate in Herb. Amb. not as to the plant from Buru; Walp. Ann. iii, 486, and v, 830; Miq Fl. Ind. Bat. iii, 121, and De Palmis, 27; Becc. Malesia, i, 88.

C. litoralis Bl. Rumphia, iii, 43; Mart. Hist. Nat. Palm. iii, 333; Walp. Ann. iii, 483, and v, 830; Miq. Fl. Ind. Bat. iii, 114, and De Palmis, 27; Teysm. Cat. Hort. Bot. Bogor. 75; Kurz Veg. Bangka in Natuurk. Tijds. Ned. Indie, xxvii (1864), 218.

C. gracilis Roxb. ? Zolling. Syst. Verzeich., 79 and exsicc. No. 2884.

Palmijuncus viminalis Rumph. Herb. Amb. v, pl. 55, f. 2 A. B.

DESCRIPTION.—Scandent, of moderate size; *sheathed stem* 2–3 cm. in diam. naked canes 15–20 mm. in diam., shining, vitreous and straw-coloured on the surface. *Leaf-sheaths* occasionally flagelliferous, gibbous above, fugaciously mealy-furfuraceous; when young armed with straight pale flat spines, which are broad and concave beneath at the base, 1–3 cm. long, almost horizontal or slightly deflexed, scattered or not very regularly arranged into more or less approximate oblique series. *Leaf-sheath flagella* very long, with the lowest spathes flattened and sparingly spinous at the margins, clawed upwards. *Leaves* 1–1·25 m. long, not cirriferous; petiole very short, rounded beneath, flattish above and armed at the sides with straight horizontal spines, rachis bifaced above, slightly rounded or flattish below, where armed, chiefly towards the apex, with strong straight spines, which are 1–4 cm. long, broad at the base; very acuminate, solitary, geminate or ternate, spreading, horizontal or deflexed; leaflets very many, pointing different ways, more or less grouped in distant fascicles of 2–4 (more rarely 5–6) on each side of the rachis, the leaflets near the apex more regularly arranged and sometimes almost equidistant and on one plane; all narrowly lanceolate, attenuate at the base, gradually acuminate at the apex, 15–30 cm. long 1–2·5 cm. broad, green, almost shining, about the same colour on both surfaces, with the mid-costa acute and spinulous above, this fainter and usually, but not always, naked beneath; secondary nerves weak, naked or sometimes sparingly spinulous beneath or on both surfaces; margins acute, regularly and closely ciliate-aculeolate. *Male spadix* opposite to the leaf, very long, decompound and ending in a long slender clawed flagellum; partial inflorescences many, diffuse, bearing 7–8 alternate spikelets on each side; primary spathes narrow, elongate-tubular, cylindrical, coriaceous, closely sheathing, almost horizontally truncate at the mouth and very shortly apiculate at one side, armed with scattered claws; secondary spathes very narrowly tubular-infundibuliform, 10–15 mm. long, truncate, entire, apiculate and ciliolate at the mouth, glabrous, unarmed; spikelets very slender, filiform, 10–20 cm. long, horizontal or deflexed, inserted at the mouth of their own spathe; spathels 30–35 in every spikelet, very small, tubulose at the base, suddenly enlarged into a broad infundibuliform, entire, laterally acute limb; each spathel with a secondary very small subscorpioid spikelet, which is composed of very few (4–8) small bi-seriate approximate flowers, rarely more; secondary spathels bracteiform, membranous, broadly ovate; involucre formed by two very small membranous, broadly ovate, acute bracteolæ, which are united by their bases but do not form a cup. *Male flowers* very small (2·5 mm. long), ovate; the calyx divided almost to the base into 3 large acute lobes, of which 1–2 are keeled and more or less distinctly ciliolate on the back; the corolla twice as long as the calyx, ovate, obtusely trigonous, glabrous, divided almost to the base into 3 ovate rather acute lobes, superficially striately veined externally; stamens with linear-subulate and—at the apex—inflected filaments; anthers lanceolate, shortly bilobed at the base; rudimentary pistil columnar, 3-dentate, shorter than the filaments. *Female spadix* about 2 m. long (including the terminal flagellum), simply decompound, with 5–6 partial inflorescences, which are shorter than those of the male spadix and bear 3–6 subdistichous spikelets on each side; primary and secondary spathes as in the male spadix; spikelets more robust than the male ones, inserted just at the mouth of their respective spathe, usually 8–10, but sometimes even 20 cm. long, with numerous bifarious flowers; spathels usually furfuraceous, short, broadly infundibuliform from a narrow base, truncate and shortly apiculate at one side at the mouth; involucrophorum very short, subdiscoid, supported and embraced by its own spathel and attached at the base of the one above; involucre orbicular, subdiscoid or shortly cupular; areola of the neuter flower depressedly lunate. *Female flowers* small, about 3 mm. long; the calyx divided into 3 ovate-acute, not distinctly striately veined lobes; the corolla as long as the calyx; filaments of the stamens forming an urceolate cup which is crowned by 6 short teeth. *Fruiting perianth* explanate. *Fruit* small pisiform, spherical or slightly depressed or sometimes subturbinate, 8–9 mm. in diam., crowned by a distinct narrow cylindric beak; scales in 15 series, dirty-yellowish, shining, channelled along the middle, not bordered by a darker intramarginal line, almost obtuse, sometimes darker at the apex, their margins entire. *Seed* globose, slightly compressed, about 6 mm. broad and 4 mm. thick, opaque, convex and deeply pitted on the back, flattish on the raphal side, with a round central chalazal fovea; albumen equable; embryo subbasal.

HABITAT.—*C. viminalis,* with its varieties, has a rather wide geographical distribution, being found in Java, India, Burma, in the Andamans and in Cochin-China, but the plant growing in Java must be considered as the type, and therefore is that which I have described above.

From this island I have seen the specimens collected by Winter near Batavia (Leyden Herb.) named *C. litoralis* by Blume, and others from the same locality in the Delessert Herbarium; these last probably came from Burmann's collections.

Zollinger's No. 2884 comes from the forests of the Province of Banjuwangi, also the No. 2652 of the same collector in Herb. De Cand. belongs to this species. The native name in Java according to Zollinger is "Rotang Glatek." Blume gives that of "R. Ayer." Rumphius says that the entire intertwined canes are made into cables for anchors.

OBSERVATIONS.—A very distinct species because of its leaflets usually pointing different ways and being grouped in many fascicles; by the leaf-rachis being armed beneath with long straight deflexed spines, which often are ternate and divaricate; and by the glomerulate male flowers which form a very short subscorpioid spikelet at each spathel. The typical *C. viminalis* (as I have already said) is the Javan plant named *C. litoralis* by Blume, which however is hardly distinguishable by constant characters from the VAR. *fasciculatus,* which name I have assigned to the ancient *C. fasciculatus* of Roxburgh, common in many parts of India and in Cochin-China.

In some Javan specimens, as, for instance, in those of Zollinger No. 2881 (Herb. Boiss. and Herb. Deless.) and in No. 2652 (in Herb. DeCand.) as many as 20–24 of the uppermost leaflets are regularly alternate in one plane, but in other specimens, also from Java, all the leaflets are distinctly fascicled and pointing different ways, and only 4–5 are regularly set at the apex. The spathels and the involucre of the male spikelets are perhaps a little smaller in the Javan than in the Indian plant.

C. viminalis was first made known by Rumphius, and was figured in vol. v of the *Herbarium Amboinense,* plate 55, f. 2, under the name *Palmijuncus viminalis,* "Rotang Java." The explanatory description of that plate is however worthless, being a "mixtum compositum" derived from heterogeneous elements, but the plate itself is so highly characteristic on account of the peculiar armature of the leaf-rachis formed by long straight deflexed spines, as to leave no doubt as to its identification.

Willdenow (1799) in the *Species Plantarum* first applied the name of *C. viminalis* to *Palmijuncus viminalis,* but he was wrong in considering all the figures of the plate 55 in vol. v of the *Herbarium Amboinense* as belonging to a single species, while figure 1 in that plate represents another species—the *Palmijuncus verus latifolius* (*C. pisicarpus* Bl.); but by the diagnosis of *C. viminalis* "aculeis . . . . . frondium distantibus reflexis," it is easy to see that Willdenow had applied that name only to the species represented in figure 2 of the said plate 55.

Blume (*Rumphia* iii, p. 45-46) has well established that the name of *C viminalis* Willd., ought to be applied to the above mentioned f. 2, plate 55, but in this plate Blume has not recognised his own *C. litoralis,* which is certainly synonymous with *C. viminalis.* Furthermore, Blume (l. c., p. 46) believes that the f. 2 of the same plate 55 cannot represent a Javan species of *Calamus,* as Rumphius writes when speaking of the Javan *Calamus* that he had not seen the leaves, and from this passage Blume infers that the *Calamus* figured in plate 55, f. 2, must be one from Buru, included by Rumphius under the comprehensive name of *Palmijuncus viminalis* But I have to point out that Rumphius, when speaking of the "Dragon Blood," shows he had had much correspondence with Javan people about Rotangs, and it is very probable that figure 2 of plate 55 had been drawn after the chapter on the *Palmijuncus viminalis* had been already written. But this is of little or no importance. What is certain is that Willdenow has established his *C. viminalis* on plate 55, fig. 2, vol. v of the *Herbarium Amboinense,* and that *C. litoralis* does not differ from this. Besides as the presence of *C. viminalis* in the forests of Buru is highly improbable, it is almost certain that figure 2 of plate 55 must have been made from examples coming from Java.

The male spadix of *C. viminalis* may be considered simply decompound like the female one, if we consider the partial inflorescences as bearing simple spikelets charged with a glomerule of flowers at each spathel; but if we consider these glomerules as true abbreviate spikelets, as sometimes they really are, then the male spadix must be called ultradecompound.

CALAMUS VIMINALIS var. FASCICULATUS Becc. in Hook. f. Fl. Brit. Ind. vi, 444 and in Rec. Bot. Surv. Ind. ii, 203.

C. fasciculatus Roxb. Fl. Ind. iii, 779 (excl. *Tsjeru-tsjurel*, Rheede); Kunth. Enum. Pl. iii, 208; Mart. Hist. Nat. Palm. iii, 209 (1st edit.), 210 (2nd edit.) and 338, pl. 116 f. iv; Walp. Ann. iii, 488 and v, 831; Griff. in Calc. Journ. Nat. Hist. v, 52 and Palms Brit. Ind. 62, pl. CXCA. II and pl. CXCVB (excl. pl. CXCVA which belongs to *C. Rotang*); Miqnel Fl. Ind. Bat. iii, 127 and De Palmis 27; Teysm. Cat. Hort. Bogor., 75; Kurz in Journ. Asiat. Soc. Beng. xliii, II, 1874, 210, pl. XXVIIB and For. Fl. Brit. Burma, ii, 517; Gamble Man. Ind. Timb. 423; Drude in Bot. Zeit. 1877, 635, pl. v, f. 1–2 (the ovary only).

C. extensus (not of Roxb.) Mart. Hist. Nat. Palm. iii, 210 partly, 1st. edit., pl. 116, f. iv, 1 (referred by Martius himself l. c. p. 210, 2nd edit. to *C. fasciculatus*).

C. pseudo-Rotang Mart. Hist. Nat. Palm. iii, 209 (1st. edit.) pl. 116, f. vi (see Mart. l. c. p. 210, 2nd edit.); Griff. in Calc. Journ. v, 42 and Palms Brit. India, 53; Kunth. Enum. pl. iii, p. 207.

DESCRIPTION.—No special characters distinguish the Javan form of *C. viminalis* from the VAR. *fasciculatus*, which name I have assigned to all extra-Javan forms of *C. viminalis*; these forms however never are perfectly like each other when the specimens come from different and remote localities. In the following notes I have registered what I have found more worthy of observation regarding them.

Subvar. BENGALENSIS. *Leaflets* very distinctly fascicled, usually very narrowly lanceolate, almost equally attenuate at both ends, very variable in size, some of them 2 cm. long and 1·5 cm. broad, others 12 cm. long and 2 cm. broad, always densely spinulous at the margins and on the mid-costa above, but naked on the latter beneath, sometimes however not only the mid-costa, but one nerve on each side of it is also spinulose underneath. The fascicles are usually composed of 2–3 and sometimes of 4–6 leaflets on each side and are often alternate with a solitary leaflet interposed; all point different ways. At the apex of the leaf very few leaflets are regularly approximate and in one plane; the lowest primary spathes are 2-keeled and armed on the margins with straight horizontal spines; the upper primary spathes tubular-cylindrical, clawed mainly on the back; the largest fruiting spikelets of the largest partial inflorescences 10–12 cm. long. *Fruit* (mature) globose or slightly turbinate, about 8 mm. in diam., distinctly beaked; scales in 16–18 series, shining straw-coloured or dirty-yellowish not or slightly and incompletely bordered with a narrow darker line and not produced into a point, faintly channelled along the middle, narrow, margins pale, scarious, finely erose. *Seed* about 6 mm. in breadth.—Frequently the ovaries are transformed into small elongate galls.

Subvar. PINANGIANUS.—The specimens from Pulo Penang (Wallich No. 8611), seem to have been gathered from plants more robust than those of Bengal. The largest primary male spikelets attain 20 cm. in length, and bear secondary scorpioid spikelets with as many as 8 flowers on each side. *Leaflets* (largest) 30 cm. by 25–28 mm.; their mid-costa with some almost spinescent bristles near the base above, and bristly beneath; one nerve on each side of the mid-costa spinulous on both surfaces.

Subvar. ANDAMANICUS.—Robust (like SUBVAR. *pinangianus*); sheathed stem 2·5–3 cm. in diam. *Leaf-sheaths* sparingly armed. *Leaflets* as in SUBVAR. *pinangianus*, but sometimes with the secondary nerves more strongly spinulous on the upper surface. *Fruit* sphæric, 8·5–9 mm. in diam., the scales in 20 series, straw-coloured with brown tip.–I have also observed this last character in the specimens of Wallich No. 8608 from Moulmein, described by Martius as *C. pseudo-Rotang*.

Subvar. COCHIN-CHINENSIS.—*Leaf-sheaths* densely armed. *Leaves* and arrangement of the leaflets as in SUBVAR. *bengalensis*. *Fruit* a little larger in this and more exactly globose; fruiting spikelets as much as 20 cm. long.—In the specimens from Cochin-China as in those from Bengal many of the ovaries are transformed into galls as figured by Kurz (*For. Fl. Brit. Burma* pl. XXVIIB), but a little shorter.

HABITAT.—The subvariety *bengalensis* is common in Bengal near Calcutta in bamboo jungle and at Cuttack, *Griffith;* at Dacca, *Hooker & Thomson* in Herb. Kew and *C. B. Clarke* in Herb. Becc.; at Chittagong and Rampore *Hooker & Thomson* in Herb. Kew; at Orissa on the banks of Mandrapara, *Gamble;* at Dowlutgunje, Dinapur, *Clarke.* There does not seem to be any essential difference between the Bengal specimens and some collected by Gamble in the Province of Madras at Valmara, Rumpa (650 m. elev.) in the district of Godavari and on the Palkanda Hills (300 met.). It is also common in Burma from Ava to Tenasserim, *Kurz* at Moulmein, *Wallich* No. 8608 in H. Kew.; at Rangoon, *McClelland* in H. Kew.; Tavoy, *Shaik Mokim* in Herb. Calc.

The subvariety *pinangianus* occurs at Pulo Penang, *Wallich* No. 8611.

The subvariety *andamanicus* occurs in the Andamans. *Kurz*, *Liebig* in Herb. Calc; *E. H. Man.* in Herb. Beccari.)

The subvariety *cochinchinensis* seems common in lower Cochin-China, where it has been collected by Pierre (No. 4848) on the mountains Kuang Repen in the Province Ipong; at Songlu in the Province Bien-hoa and on the mountains Dây in the Province Chandoc.

According to Roxburgh the Sanskrit name of *C. fasciculatus* is Umba-vetus and the Hindustani and Bengalese "Bura Beṭ." Gamble gives the names of "Bara Beṭ" in the Bengali and of "Kyeing Kha" in the Burmese languages.

Pierre (MSS.) gives the following Cochinchinese names:—"May cat" (Annamite); "Sin lat" (Moi); "Padao Kree" (Kmer). The Rotang is much used in India, as it is in Cochin-China.

OBSERVATIONS.—I have not been able to discover any specific character to distinguish *C. fasciculatus* Roxb. from *C. viminalis* Willd. Roxburgh himself (l. c. p. 779) rightly identified his *C. fasciculatus* with Rumphius' *Palmijuncus viminalis* (Herb. Amb. v, t. 55, f. 2, A, B) of which he says that the figure agrees pretty well with this species but not with his description.

In the Palms of British India are quoted by Griffith as representations of *C. fasciculatus* Roxb. the plates cxcA, f. 2 and cxcv, A and B. The first of these three plates doubtless reproduces a fruiting spadix of *C. viminalis*, as the plate cxcvB reproduces one of its characteristic leaves. It seems also to me, notwithstanding the doubts expressed by Griffith, that the portion of spadix accompanying that leaf belongs to *C. viminalis*, but not so the plate cxcvA, which has nothing to do with *C. viminalis*. This plate is one of those reproduced from Roxburgh's drawings, and it seems to me to represent *C. Rotang* Roxb. that is *C. Roxburghii* Griff.; see observations on this species.

As *C. fasciculatus* is one of the commonest Rotangs in Cochinchina, it would seem rather strange that Loureiro has not mentioned this species which, however, I have been unable to recognize in any of the very imperfect diagnoses of that author. In some characters it would correspond to *C. rudentum*, but this is described with the stem "*nec nitidus*," i.e., with opaque surface, while the canes of *C. viminalis* are shining or vitreous.

PLATE 57.—C. viminalis fasciculatus *var.* bengalensis. Terminal portion of a leaf; two intermediate leaflets; partial inflorescence with male flowers (on the left side of the plate) and apex of a fruit spadix (in the upper part of the plate), from specimens from Dacca collected by C. B. Clarke (in Herb. Becc.); a spikelet (at the base of the plate) with full-grown fruit; detached seeds (one longitudinally cut) from Dinapur, (C. B. Clarke in Herb. Becc.).

C. viminalis fasciculatus *var.* cochinchinensis. Leaf-sheaths with the base of a leaf and of a spadix; an intermediate portion of a leaf, a male spikelet and a spikelet with mature fruit (all of these figures on the right hand side); from Pierre's specimens No. 4848 in Herb. Becc.

PLATE 58.—C. viminalis fasciculatus *var.* andamanicus. Portion of the sheathed stem with the base of the leaves and the first portion of a flagellum; an intermediate portion of a leaf (from Man's specimens in Herb. Becc.); partial inflorescence with female flowers, and another inflorescence with mature fruit, detached fruit and seed (from specimens of the Calcutta Herbarium).

45. CALAMUS SIAMENSIS Becc. in Rec. Bot. Surv. Ind. ii, 203.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* 17 mm. in diam. *Leaf-sheaths* gibbous above, armed with many pale, subulate, laminar, straight or flexuose, solitary or confluent or obliquely seriate spines, of which the largest are 2–3 cm. long, but mixed with numerous much smaller ones. *Ocrea* about 1 cm. long, dry-membranous, ultimately brittle and deciduous. *Leaves* not cirriferous; about 1 m. in length; petiole very short (2–3 cm. long), flat above, armed at the sides with a few long, flat, straight, horizontal or deflexed spines, and on the roundish back with many other similar but shorter spines; rachis acutely bifaced and spinulous above, armed beneath with straight deflexed spines (as much as 15–20 mm. long) and hooked prickles, which have often a very long point or are of the usual kind, chiefly on the terminal portion of the leaf; furthermore the rachis is armed also at the sides in its lower portion with variable short or long slender spines; leaflets very numerous (more than 40 on each side), very closely set in one plane (not crossing one over the other or pointing different ways), equidistant, 10–15 mm. apart, narrowly lanceolate, uni-costate, with the side nerves rather weak, attenuate towards the base and rather suddenly acuminate at the apex, opaque on the upper surface where the mid-costa is furnished with a few rather strong and rigid spinules, and the side-nerves are naked; lower surface paler than the upper one, almost glaucous, with the not prominent mid-costa and one nerve on each side of it usually but not always finely spinulous; transverse veinlets much interrupted; margins ciliolate serrate with fine and rather approximate and spreading spinules; the largest leaflets, the mesial, 15–22 cm. long, 12–17 mm. broad, the others slightly smaller and gradually decreasing towards the apex; the two of the terminal pair shorter and narrower, free at the base. *Male spadix* . . . . . *Female spadix* simply decompound, very similar to that of *C. fasciculatus ;* primary spathes narrow-tubular, very closely sheathing; the lowest acutely 2-edged, densely armed with scattered, variable, often short, patent or slightly deflexed spines; upper primary spathes cylindric, armed rather densely with scattered aculei, entire, obliquely truncate and acute on one side at the mouth; partial inflorescences erecto-rigid, 12–25 cm. long with 5–6 distichous spikelets (2–3 cm. apart) on each side; secondary spathes unarmed, narrowly tubular-infundibuliform, obliquely truncate and apiculate-subulate at the mouth on one side; spikelets at first erecto-patent, later horizontal or deflexed, slightly arched, inserted just above the mouth of their respective spathes, slightly callous at their upper axilla, the lower ones the largest, 8–9 cm. long, composed of about 30 spathels, the upper ones somewhat shorter. *Female flowers* numerous, very closely set and very conspicuously 4-seriate, as two flowers equally developed and fertile are inserted at each spathel with a sterile flower between the two; spathels shortly and broadly infundibuliform, rather thin in texture, glabrous, very finely striately veined, truncate at the mouth, often split, prolonged at one side into a short triangular point; involucrophorum small, entirely hidden in its own spathel at the base of the one above, submembranous, extended right and left into a triangular, bracteiform, acutely keeled scale; each of these scales embracing a distinct concave calyculiform involucre, which is flat and two-keeled on the side of the surfaces in contact: only one of the involucres, the uppermost, bears a neuter flower which is inserted a little above the two fertile ones. *Female flowers* (when in bud) small, ovate, 2·5 mm. long; the calyx divided into 3 ovate lobes, very finely striately veined outside and thin in texture; the segments of the corolla acute, as long as and slightly narrower than the lobes of the calyx; filaments of the stamens highly connate at the base, dentiform, broad and short in the free portion; anthers sagittate. *Neuter flowers* smaller and more slender than the female ones, with the corolla twice as long as the calyx, empty anthers, and a small rudimentary ovary. *Fruiting perianth* explanate, its calyx split down to the base. *Fruit* small, spherical, pisiform (about 8 mm. in diam.), very shortly and minutely, apiculate; scales channelled along the middle, in 15 series, light-coloured, shining with a whitish scarious marginal line and finely erosely toothed margin, often with a reddish point. *Seed* very small, globular, deeply and irregularly grooved on the dorsal face.

HABITAT.—First discovered by Sir R. Schomburgh in Siam. (♀ specimen in flower in Herb. Kew), and found there again in fruit by Dr. Wawra at Bangkok during the voyage of the Austrian man-of-war "Donau" in 1868—71. (Fruit specimen No. 347 in the Herb. Vindob.)

OBSERVATIONS.—*C. siamensis* appears closely related to *C. fasciculatus*, from which it differs in the equidistant leaflets and the geminate female flowers at each spathel—a very rare occurrence in the genus. Other species have spikelets with 4-seriate flowers, but 2 of the series are of ♀ and two of ♂ flowers. In *C. siamensis*, the 4 series are all of ♀ flowers besides the two series of sterile ones.

PLATE 59.—Calamus siamensis *Becc.* A portion of the type-specimen preserved at Kew with the lower portion of a leaf and of a young fruit spadix and the base of another spadix in flower; a detached entire partial inflorescence.

46. CALAMUS CONCINNUS Mart. Hist. Nat. Palm. iii, 208 (ist edit.) and 332, pl. 116 fig. X; Kunth. Enum. Plant. iii, 207; Walp. Ann. iii, 483 and v, 829; Griff. in Macl. Calc. Journ. v, 49 and Palms Brit. India, 59; Kurz in Journ. Asiat. Soc. Ben. xliii, II (1874) 214, pl. xxC; Hook. f. Fl. Brit. Ind. vi, 444; Becc. in Rec. Bot. Surv. Ind. ii, 204.

DESCRIPTION.—Scandent, of moderate size. *Leaf-sheaths* . . . . . *Leaves* large, not cirriferous (not seen entire); petiole . . . . . ; rachis (of the upper part of the leaf) sprinkled with small brown scales, acutely bifaced above, flattish below, where armed along the middle (up to the apex) with straight rather long (2–3 cm.) deflexed spines and marked with the deep impressions left by them in the prefoliation; leaflets numerous, grouped in fascicles of many (at least in the lower and middle portions of the leaf), green even when dry and quite of the same colour on both surfaces, shining, with the mid-costa stout and acute above, also strong, but more obtuse, beneath, sprinkled mainly from the middle upwards with very small inconspicuous spinules ou both surfaces; secondary nerves 3–4 on each side of the mid-costa, all equally weak, but one or two of them on each side of the mid-costa sometimes indistinctly tuberculate-spinulous on both surfaces or upon one only; transverse veinlets crowded, sharp, very distinct, interrupted; margins finely and very appressedly spinulous; the largest leaflets 50–60 cm. long and 3–3·5 cm. broad, ensiform or elongate-oblanceolate, slightly narrowed at the base where suddenly plicate, rather suddenly acuminate at the apex; the uppermost much shorter and more attenuate at the base; the two of the terminal pair entirely free at the base. *Male spadix* (not seen entire) very large, ultrasupra-decompound, furfuraceous; primary spathe elongate-tubular, unarmed (in the small portion seen); partial inflorescences forming a panicle 22–25 cm. long with various (about 12) branchlets (primary spikes) of which the lowermost, the largest, are branched again with 7–8 spikelets on each side; secondary spathes unarmed, membranous, dry, subscarious, infundibuliform, rather enlarged and loosely sheathing above, obliquely truncate at the mouth and prolonged at one side into a triangular acuminate point; tertiary spathes of the branchlets narrowly tubular at the base and suddenly broadened into an infundibular-campanulate truncate entire limb which is acute at one side; primary or compound spikelets inserted at the mouth of their own spathe, callous and with a deep rima at their upper axilla, the largest, the lowest, 7–8 cm. long with many very delicate secondary spikelets, each 1–2 cm. long, patent or horizontal, callous in their upper axilla, gradually decreasing in length and number of flowers from the base upwards; the largest secondary spikelets with 10–12 very closely packed flowers on each side; spathels very crowded, bracteiform, deflexed, concave, ovate, acute or acuminate; involucre slightly concave, subcymbiform, clearly formed by two broad and acute bracts united by their bases, spathels and involucres strongly striately veined. *Male flowers* distichous, very small, 2 mm. long, ovate, acute; calyx membranous, deeply trilobate; corolla divided into 3 ovate-lanceolate acute segments, twice as long as the calyx. *Female spadix* (not seen entire) simply decompound; partial inflorescences 15–30 cm. long, with 3–6 spikelets on each side; secondary spathes infundibuliform, membranous, subscarious, ultimately marcescent; spikelets callous at their upper axilla, 8–12 cm. long, with 18–20 distichous flowers on each side; spathels furfuraceous, narrowly tubular at the base, suddenly enlarged into a broad infundibuliform truncate limb; involucrophorum half-exserted from its own spathel, laterally adnate to the base of the one above, dimidiately cupular or of the shape of a swallow's nest, strongly callous at the axilla next the axis; involucre cupular, rather deep; areola of the neuter flower broadly ovate or almost circular, with sharp and raised borders. *Female flowers* small, ovate, acute, about 3 mm. long *Fruiting perianth* explanate, its calyx divided down almost to the base into 3 ovate not distinctly striately veined lobes; the segments of the corolla as long as the lobes of the calyx, but somewhat narrower. *Fruit* small, [globose (about 8–9 mm. in diam.), apiculate; scales in 18 series, of a dirty-straw colour, subshining, rather deeply channelled along the middle with a darker short scarious not fimbriate tip; margins narrow, scarious, finely erosely toothed. *Seed* suborbicular, flattish on the raphal side, with a not very deep circular chalazal fovea, very coarsely and deeply pitted and tubercled on the convex back; albumen equable; embryo basal.—All parts of the spadix covered with a detachable brown indumentum.

HABITAT.—Tenasserim in the Province of Mergui, where it was gathered by Helfer on the 8th January 1839 (Nos. 6388, 6394, 6395 Herb. East India Comp. in Herb. Kew). In Webb's Herbarium at Florence the male specimen bears the No. 6395. Kurz quotes for this species also Wallich's No. 8607, which I have not seen.

OBSERVATIONS.—The specimens I have examined are in a very fragmentary condition. Martius describes this *Calamus* as an erect or almost stemless species, but a note by Helfer in the Herbarium at Kew states that it is a common palm, climbing on the higher trees and that it is armed with strong and powerful spines.

It is very [apparently related to *C. fasciculatus*, from which it differs in the much larger leaves and leaflets; in the spathels with a larger, loose, almost inflated dry membranous limb; and in the male spadix being supradecompound.

The fruit is very similar to that of *C. fasciculatus*, but the scales are deeply furrowed.

PLATE 60.—Calamus concinnus *Mart.* Partial inflorescence with flowers, from Helfer's No. 6094 in Herb. Kew; large leaflets (seen from the upper surface) and partial inflorescence with young and mature fruit, from No. 6388 in Herb. Kew; male partial inflorescence from No. 6395 in Herb. Kew; portion of a leaf (seen from the lower surface), from male specimen No. 6395 in Webb's Herb. at Florence.

47. CALAMUS MOLLIS Blanco Fl. de Filip. 1st edit., 264 and gran edicion i, 329; Kunth. Enum. Pl. iii, 594; Mart. Hist. Nat. Palm. iii, 336; Walp. Ann. iii, 486 and v, 831; Miq. Fl. Ind. Bat. iii, 123; Becc. in Rec. Bot. Surv. Ind. ii, 204, and in Perkins Fragm. Fl. Philipp. i, 46.

C. Haenkeanus Mart. l. c. iii, 212 (1st edit.) and 337; Kunth. Enum Plant. iii, 211; Walp. Ann. iii, 488, and v, 831; Miq. Fl. Ind. Bat. iii, 127.

C. usitatus (not of Blanco) Mart. l. c. 340.

Calamus sp., Cuming, No. 1478; Vidal Phan. Cuming. 154.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* flagelliferous when not spadicigerous, gibbous above, densely bristly at the mouth, furfuraceous when young, more or less armed with straight slender spines which leave rather deep impressions on the surface of the sheath. *Ocrea* very short, spinulous. *Leaves* not cirriferous, broadly ovate in outline, rather short, 40–70 cm. long; petiole rather short, flat above and very sparingly spinulous; rachis fugaciously furfuraceous, acutely bifaced and smooth above, flattish beneath where armed with solitary black-tipped claws; leaflets subequidistant and not very regularly alternate in the upper part of the leaf; usually inequidistant but not distinctly grouped nearer the base, narrowly lanceolate or linear-lanceolate, gradually acuminate into a bristly tip; attenuate at the base, glabrous, thinly chartaceous, not shining above, almost of the same colour on both surfaces, the mid-costa very acute and spinulous above, where accompanied by 3–4 rather weak, usually naked secondary nerves, of which sometimes one on each side of the mid-costa is sparsely spinulous and somewhat stronger than the others, in this case (the leaflets) faintly 3-costulate; beneath the mid-costa not prominent, but also bristly-spinulous as, very sparingly, is often one of the secondary weak nerves on each side of it; transverse veinlets distinct, much interrupted and not very crowded; margins very slightly thickened by a very slender nerve and rather strongly spreadingly spinulous-serrulate; the largest leaflets, those a little above the base 20–40 cm. long, 22–25 mm. broad, the others rather speedily decreasing in length; the two of the terminal pair 8–15 cm. long, free at the base. *Male spadix* elongate, flagelliform, ultradecompound, with not many distant partial inflorescences and a terminal filiform appendix which is aculeolate all round; primary spathes very long, the lowest flattened; the upper ones tubular, very closely sheathing, thinly coriaceous and armed with many small recurved aculei, often more or less withered at the apex and furnished, when young, at the mouth with many paleaceous bristles; the axial unsheathed portions between two partial inflorescences flattened on the inner side, convex and strongly armed on the back with solitary or more or less aggregate claws; partial inflorescences not numerous, remote, inserted not very far inside the mouth of their own spathe and arising erect from this; the largest, the lowest, 20–30 cm. long, forming a rather dense compound panicle, which bears few branchlets or compound spikes in its lower portion and many simple spikelets in the upper part, the latter decreasing in length from the base towards the summit; the upper inflorescences gradually smaller, the extreme only 6–8 cm. in length, undivided, and with 4–10 distichous spikelets on each side; secondary spathes very narrowly tubular-infundibuliform, obsoletely angular, gradually decreasing in length from the base to the top of the panicle, more or less obliquely truncate, deciduously ciliolate at the mouth and prolonged at one side into a short, triangular, subulately acuminate often withered point; spikelets inserted at the mouth of their own spathe, callous at their upper axilla, the largest (the lowest of each branchlet) 2–3·5 cm long, with 10–15 up to 20 flowers on each side, complanate, straight at first, arched or subscorpioid after the fall of the flowers; the uppermost not more than 1 cm. long; spathels very closely packed, bracteiform, concave, very broad, embracing the flowers, horizontal or slightly deflexed, striately veined externally, often ciliolate, acute or apiculate at one side; involucre included in its own spathel and laterally attached at the base of the one above, dimidiately cupular or like a swallow's nest, truncate, deeply lunately emarginate and acutely two-keeled and bidentate on the side next to the axis. *Male flowers* perfectly bifarious, very crowded, the one in contact with the next, inserted at a rather open angle, ovate, small, 2·5–3 mm. long, obtuse or sub-apiculate; the calyx sub-campanulate, faintly striately veined externally, divided down almost to the middle into three large acute lobes, with pale subscarious margins; the corolla twice as long as the calyx, divided down to its lower third part into three ovate, acute and externally polished segments; the filaments of the stamens rather stout and rigid, subulate with inflected apices when in the bud and united by their bases into a fleshy body as long as the undivided part of the corolla; the anthers versatile, lanceolate and acute, their cells discrete at the base; the rudimentary ovary formed by three subulate rigid bodies united by their bases and inserted in the fleshy infundibuliform disc formed by the base of the anthers. *Female spadix* simply decompound, flagelliform like the male, but perhaps smaller, about 70 cm. long, including a not very long aculeolate apical flagellum; lowest primary spathe tubular, somewhat flattened, acutely two-edged, very sparingly spinulous; the upper spathes cylindraceous, often split on the ventral side at the summit; partial inflorescences few, the lowest, the largest, 15–20 cm. long with a straight rigid axis, and with 8–9 distichous spikelets on each side; secondary spathes as in the male spadix; spikelets arched, patent or slightly deflexed, more or less distinctly callous in their upper axilla; the lowest, the largest, 2·5–4 cm. long, with 12–18 distichous very crowded flowers on each side; the upper ones gradually shorter and more approximate; spathels very closely packed, bracteiform, a little larger than but of the same shape as in the male spikelets; involucrophorum embraced by its own spathel and attached at the base of the one above, with a short concave unilaterally evolute limb; involucre concave, unilaterally evolute, sub-auriculiform, obtuse; areola of the neuter flower nearly round, sharply defined by an acute and sometimes denticulate border. *Female flowers* very small, about 3 mm. long; the calyx obconic-campanulate, narrowing at the base, divided down to the middle into 3 broad acute lobes; corolla one-third longer than the calyx, divided into 3 lanceolate acute segments; the stamens united by their bases and forming a very high membranous urceolum which is crowned by 6 broad triangular acute teeth, of which 3 appear amongst the segments of the corolla and simulate an additional whorl of the corolla; the anthers sterile, sagittate at the base, obtuse at the apex. *Fruiting perianth* not pedicelliform, explanate. *Fruit* ovoid-elliptic or subobovate, small, about 1 cm. long, 6 mm. thick, very suddenly contracted into a rather long beak; scales in 16 series, faintly channelled along the middle, light greyish-yellow, sometimes indistinctly spotted at the apex, with paler erosely toothed margin. *Seed* very small, 4–5 mm. long, somewhat flattened and very irregularly angular with an indistinct chalazal fovea; albumen equable; embryo basal.

HABITAT.—Philippine Islands, where it seems a common plant, *Cuming* No. 1478 in Herb. Kew, Vindob., Deless., Boiss. and St. Petersburg; in the last with the locality "South Camarinas" on the label; at Manilla collected by Gaudichaud during the voyage of the "Bonite" in December 1836 (in Herb. Webb and Deless.; specimens named by Martius himself); *Llanos* in Herb. Delessert (with the name *C. usitatus* Blanco); district of Morong, *Vidal* No. 1939 in Herb. Kew; mountains of Boso-boso, *Loher* Nos. 1372, 1367, in Herb. Kew; Luzon, Mariveles, *Warburg* No. 12506 in Herb. Berol.; Antipolo, province of Rizal, *Merrill*, No. 1743 ♀, 1642 ♂; Arayat, province of Pampanga, *Merrill* No. 1411.

OBSERVATIONS.—I have described the male plant from the specimens collected by Gaudichaud at Manilla and seen by Martius, and the fruit from the No. 12506 of Warburg in the Herbarium at Berlin.

I am not quite certain that the *Calamus* named by Martius *C. mollis* is really that published by Blanco under this name, but in the absence of authentic specimens of the true *C. mollis*, I have followed Martius. Furthermore this author has considered as belonging to *C. usitatus* Blanco, a partial inflorescence with immature fruit of *C. mollis* also collected by Gaudichaud at Manilla (Herb. Deless.) and therefore apparently Martius has given the name of *C. mollis* to the male plant and of *C. usitatus* to the female one of the same species. *C. usitatus* has been identified by me with *Dæmonorops Gaudichaudii.* The arrangement of the leaflets in *C. mollis* is very variable, as in some leaves they are almost equidistant, with only very few spaces between the leaflets slightly larger than usual, while at other times these spaces are rather long and very variable, chiefly towards the apex of the leaf which then looks very much like that of *C. Blancoi.*

Vidal's No. 1939 in the Kew Herbarium belongs to a more robust form than the type specimens of Cuming and Gaudichaud; one of its partial male inflorescences being 30 cm. long, rather compact, with many secondary branchlets charged with numerous 4 cm. long spikelets. *C. mollis* is characterised as follows:—Rather slender, leaf-sheaths sparingly spinous; leaves short, petiole very short, leaflets narrowly lanceolate, not very numerous, inequidistant but not fascicled, narrowly lanceolate, uni-costate or sub-3-costulate; spadices flagelliform, spikelets with very closely packed bracteiform spathels; fruit small, subobovate-elliptic, 1 cm. long, including the beak.

The description of *C. Haenkeanus* Mart. (l. c., 2 edit., 337) agrees pretty well with the characters of *C. mollis*, but the fruit is described as having about 24 longitudinal series of scales, a rather extraordinary number. However, in the description of the same species at p. 212 of the first edition no characters are given of the fruit.

PLATE 61.—Calamus mollis *Blanco.* Apex of a leaf and portion of a male spadix from Gaudichaud's specimens in Herb. Delessert, one of the type specimens of Martius.

PLATE 62.—Calamus mollis *Blanco.* Apex of a leaf and a female partial inflorescence in flower (on the lower part of the right hand side of the plate), from Cuming's No. 1478 in the Berlin Herb.; the upper part of a plant with an entire leaf and fruit spadix from Warburg's No. 12506 in the Berlin Herb.; the detached fruits and seeds near the base of the plate do not belong to *C. mollis.*

48. **CALAMUS MEYENIANUS** Schauer in Mey. Observ. Bot. in Nov. Act. Acad. Caes. Nat. Cur. xvi, (1843), suppl. 1, 425; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 10–12 mm. in diam. *Leaf-sheaths* flagelliferous, very thinly covered with a brown evanescent furfuraceous indumentum, gibbous above, quite unarmed, finely and distinctly striate longitudinally, greenish even when dry. *Ocrea* naked, exsuccous, brittle, deciduous. *Leaves* not cirriferous, in one specimen 70 cm. long including the petiole, which is 10 cm. long and almost unarmed, rounded and striate beneath, with 3 shallow narrow channels (the mesial the deepest) on the upper face, the margins acute and smooth; rachis convex beneath in the lower portion, flattish upwards, and almost regularly armed there throughout to the apex along the middle with small solitary claws; leaflets rather numerous (54 in all) conspicuously inequidistant, usually in pairs on one side in the lower third of the rachis with the pairs almost opposite and 3–5 cm. apart; in the upper third irregularly alternate, more approximate than lower down, membranous, linear-lanceolate, narrowed a good deal towards the base, very acuminate to the apex, dull, greenish even when dry, almost of the same colour on both surfaces their mid-costa acute, naked or sparingly spinulous above, where accompanied on each side by some slender secondary nerves; beneath only the mid-costa moderately spinulous; margins remotely spinulous; the largest leaflets, those a little above the base, 25–27 cm. long by 15–17 mm. in breadth; the lowest narrower but of the same length; the upper ones gradually shorter but not narrower; the two of the terminal pair free at the base, at most 7–8 cm. long. *Female spadix* simply decompound, elongate, flagelliform (not seen entire, but probably flagelliferous at the apex), its attenuated basal portion between two partial inflorescences armed on the outer side with many scattered or approximate claws; lowest primary spathe very long, strictly sheathing, flattened and acutely two-edged, quite unarmed, truncate at the mouth; upper spathes not seen; partial inflorescences probably few, the two I have seen about 20 cm. long with 6 spikelets on each side; secondary spathes narrowly tubular, slightly enlarged above, naked, finely longitudinally striate, obliquely truncate at the mouth and prolonged at one side into a triangular acute point, which is patent or deflexed; spikelets subscorpioid, horizontal or deflexed, inserted just at or a little above the mouth of their own spathe, not or indistinctly callous at their axilla; the lowest spikelets 3–4 cm. long, with 10–15 flowers on each side, the uppermost one-half shorter; spathels very crowded, bracteiform, concave, broadly ovate, finely striately veined, acute; involucrophorum very short, asymmetrically cupular, obscurely 2-toothed on the side next to the axis; involucre cupular, slightly unilaterally evolute; areola of the sterile flower very conspicuous, almost cupular, broadly ovate or subcircular, only one-half smaller than the involucre. *Female flowers* very small, 2 mm. long. *Fruiting perianth* explanate, its calyx entirely split into 3 broad, ovate, subapiculate and obscurely striately veined lobes; its corolla slightly longer than the calyx with ovate-lanceolate acute segments. *Fruit* very small, when very nearly ripe 8 mm. long, and 5 mm. in diam., ovate or obovate, rounded at both ends, distinctly mucronate at the apex; scales light-greenish, obtuse, in 18 longitudinal series, polished, rather deeply channelled along the middle, with narrow paler scarious finely erosely toothed margin. *Seed* very small, about 5 mm. long, very irregularly angular, with an indistinct chalazal fovea; albumen equable; embryo basal.—All parts of the plant take in drying a light green colour.

HABITAT.—The Philippine Islands. It was discovered by Meyen near the village of San Matheo on Mount Masiquie in Luzon at about 200 m. elevation; see Meyen, Reise ii, pp. 233 and 269. One specimen of this species is preserved in the Paris Herbarium and was collected by M. Callèry at Panganisan in 1840.—Tagala name "Bamban" (Meyen).

OBSERVATIONS.—I have seen of this the authentic specimens in the Berlin Herbarium; those exactly agree with that of Callèry in the Paris Herbarium. It differs from *C. mollis* in the entirely unarmed leaf-sheaths and in the smooth primary spathes; in the reproductive organs I have been unable to find any appreciable difference from *C. mollis*, of which it seems nothing more than a variety.

PLATE 63.—Calamus Meyenianus *Schauer.* Callèry's entire specimen in the Herbarium at Paris.

49. **CALAMUS BLANCOI** Kunth, Enum. Plant. iii (1841), 595; Mart. Hist. Nat. Palm. iii, 343; Walp. Ann. iii, 492 and v, 832; Miq. Fl. Ind. Bat. iii. 139; Becc. in Rec. Bot. Surv. Ind. ii, 204.

C. gracilis (not of Roxb.) Blanco, Fl. de Filip. 1st edit. (1837), 267 and gran edic. i, 332.

C. brevifrons Mart. l. c. iii, 338; Miq. l. c. iii, 127.

C. parvifolius Vidal, Phan. Cuming. No. 1229.

DESCRIPTION—Scandent, very slender. *Sheathed stem* 5–7 mm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, more or less grey-furfuraceous, smooth or more or less armed with straight, very slender, needle-like or almost bristly brown

spines, which are erect or patent, pointing different ways and arising from a tubercled base; the spines are longer and more numerous at the mouth than elsewhere. *Ocrea* very short, very densely hairy-bristly. *Leaves* not cirriferous, 35–40 cm. long, petiole very short (15–25 mm. long), flat above, more or less armed, mainly at the sides and beneath, with some straight long and slender or short spines; rachis fugaciously furfuraceous, irregularly trigonous, slender, armed beneath along the middle with slender claws and sometimes, especially at the sides of its basal portion, with distant straight spines; leaflets few (14–17 in all), very conspicuously inequidistant, solitary or sub-geminate on each side, alternate or almost opposite, with long and irregular vacant spaces amongst them, linear or very narrowly linear-lanceolate, subulately acuminate to a hairy-bristly point; the two of the terminal pair shorter than the others, free or very slightly connate at the base; the largest, those a little above the base, 25–30 cm. long, 7–12 mm. broad; the basal pair scarcely shorter than the mesial ones and occasionally very narrow; all glabrous, green even when dry, not shining, of the same colour on both surfaces, thinly papyraceous, with the mid-costa very acute above, not prominent beneath, more or less remotely spinulous or even smooth on both surfaces; secondary nerves (2–3 on each side of the mid-costa), very weak and naked on both surfaces; margins minutely and remotely spinulous, slightly thickened by a weak secondary nerve; transverse veinlets rather distant and much interrupted. *Male spadix* slender, flagelliform, 50–60 cm. long, partially ultradecompound or simply decompound, inserted near the mouth of the leaf-sheaths and with 2–3 partial inflorescences only; lowest primary spathe flattened; upper primary spathes tubular-cylindraceous, closely sheathing, very elongate, truncate and more or less densely hairy-bristly at the mouth, sprinkled on the upper part with very small slender aculei and armed on the back of the attenuated basal part between two partial inflorescences with relatively strong claws; partial inflorescences inserted not very far inside the mouth of their respective spathes, from which they issue erect with a short peduncular part; the largest, the lowest, 6–10 cm. long, branched near the base and with 3–5 distichous spikelets on each side upwards; secondary spathes very narrowly tubular-infundibuliform, their mouth ciliolate and prolonged at one side into an acute triangular point; spikelets inserted just at the mouth of their respective spathes, callous at their upper axilla, horizontal and ultimately arched and recurved; the lowest, the largest, 10–15 mm. long, with 6–10 distichous flowers on each side; the others gradually shorter, more approximate and with fewer flowers; spathels broad, concave, spoon-shaped, embracing the flowers, horizontal or slightly deflexed, striately veined outside, often ciliolate, acute or apiculate at one side; involucre cupular, two-keeled, deeply emarginate and bidentate or even bilobate on the side next the axis. *Male flowers* small, 3 mm. long, gradually ettenuate to the apex; calyx striately veined externally, divided down almost to the middle into three broad acute lobes; corolla about twice as long as the calyx, divided down a little past the middle into three lanceolate acuminate segments, polished externally; filaments of the stamens rather stout and rigid, subulate, inflected at the apex when in the bud, united by their bases and forming a fleshy body as long as the undivided portion of the corolla; anthers versatile, lanceolate, acute, their cells deeply discrete at the base; rudimentary ovary formed by three subulate rigid bodies which are united by their bases, inserted in the fleshy infundibuliform disc formed by the base of the stamens and rise above the base of the anthers when in the bud. *Female spadix* simply decompound, with 2–3 erect partial inflorescences, of which the lowest, the largest, is 8–10 cm. long, with 3–4 alternately distichous spikelets on each side; secondary spathes as in the male spadix; spikelets 2–2·5 cm. long, inserted at the mouth of their own spathes and more or less distinctly callous at their axilla charged with 6–8 flowers on each side; spathels very shortly and broadly infundibuliform, striately veined, with a broadly triangular apiculate withered point; involucrophorum unilaterally cupular, attached to the base of the spathel above its own; involucre concave, unilaterally evolute, sub-auriculiform, obtuse; areola of the neuter flower roundish, sub-callous, sharply defined by an acute and often denticulate border. *Neuter flowers* very similar to the male ones, but slightly smaller. *Female flowers* small, 3 mm. long, ovate; the calyx rounded at the base, striately veined externally, divided down almost to the middle into three broad acute lobes; the corolla divided down almost to its lower third part into three ovate-lanceolate acute segments, which are one-third longer than the calyx; urceolum formed by the base of the stamens, membranous, crowned by six broad, triangular, short, acute teeth; anthers auricled, sagittate at the base and obtuse at the apex; ovary oblong, slightly attenuate at the base, style thick and large relatively to the ovary; stigmata small, trigonous, acute. *Fruiting perianth* explanate.—The mature fruit not seen.

HABITAT.—Philippine Islands; Luzon in the province of Albany, *Cuming* No. 1225 in Herb. Kew. Deless., Flor., Boiss. and Vindob.; Mariveles, *Loher* No. 1376 in Herb. Kew.

OBSERVATIONS.—This is a much more slender plant than *C. mollis*, but is however very closely related to, and possibly only a variety of that species; it has fewer, narrower and more inequidistant leaflets and the spathels in the female spikelets are distinctly infundibuliform and not very approximate and bracteiform.

It is not certain that Cuming's No. 1225 really corresponds to the *C. gracilis* of Blanco, a name which has been changed by Kunth into that of *Blancoi*, the first having been previously employed by Roxburgh for an Indian species. Nevertheless in the absence of those of Blanco, we may take as type-specimens those distributed by Cuming under the above-mentioned number 1225.

Cuming's specimens have rather densely spinulous sheaths. The specimen of Loher in the Kew Herbarium, with a female spadix in flower, differs from those of Cuming only in the wholly unarmed leaf-sheaths; it is also more robust in every part.

PLATE 64.—Calamus Blancoi *Kunth.* Cuming's entire specimen in Herb. Delessert.

50. **CALAMUS RIVALIS** Thw. C. P. No. 3914; Trimen in Journ. Bot. xxiii, (1885), 268 (err. typ. *nivalis*); Hook. f. Fl. Brit. Ind. vi, 441; Becc. in Rec. Bot. Surv. Ind. ii, 199.

DESCRIPTION.—Scandent, rather slender, more or less rusty-furfuraceous on the different parts of the spadix, on the leaf-sheaths and on the leaf-rachis (when young) and more permanently on the flowers and their involucres. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* sometimes flagelliferous, gibbous above, armed with scattered, flat, rigid, subulate, straight or sinuous, solitary, yellowish, horizontal or slightly deflexed spines which are 8–10 mm. long, more or less scaly-furfuraceous on the margins in youth and glabrous and polished later; those near the base of the petiole longer, more slender and erect. *Ocrea* (of the full-grown leaves) short, obliquely truncate, glabrous and finally brittle and deciduous. *Leaves* about 1 m. long, not cirriferous; petiole sometimes not more than 2–3 cm. in length; broadly channelled above, rounded beneath, armed at the margins and in the first portion of the rachis with spreading straight spines, which are of variable length and are gradually transformed into claws; rachis in the upper portion acutely bifaced above, rounded beneath, where armed with solitary claws throughout along the middle and only at the margins in its first portion; leaflets numerous, rather closely and very regularly set, alternate or sub-opposite, almost of the same colour on both surfaces, linear-lanceolate or ensiform, shortly attenuate and abruptly plicate at the base, very gradually acuminate into a bristly-brushed tip, rather distinctly 3-costate; on the upper surface the mid-costa acute and prominent, naked throughout or spinulous near the apex, and with the side costæ slender and usually, but not always, sparingly spinulous; beneath, the mid-costa bears some long bristles and the side-nerves are weak and smooth; margins slightly thickened by a secondary rather distinct nerve, which is spinulous, remotely near the base and closer towards the apex; transverse veinlets rather crowded, fine, very distinct; the largest leaflets, those near the base, 40–45 cm. long, 15–20 mm. broad, the upper ones gradually smaller, the two of the terminal pair (the smallest) 11–12 cm. long, 1 cm. broad, opposite and free at the base. *Male spadix* partially ultra-decompound, elongate, about 2 m. in length, including a terminal slender, not very long, finely clawed flagellum; partial inflorescences few, remote and very long, as much as 60–65 cm. long, terminating in a very short (1–2 cm. long) caudate appendix and furnished with some compound spikes in their lower portion and many simple spikelets upwards (20–26 on each side in all); primary spathes tubular, closely sheathing, very narrow; the lowest somewhat compressed and two-edged, truncate at the mouth, more or less armed, mainly on the edges, with short straight horizontal or deflexed spines; the upper ones very elongate, 30 cm. in length or even longer, cylindrical, very closely sheathing, obliquely truncate at the mouth where they are extended at one side into a short triangular point, sparsely armed with small slender recurved needle-like spines; the attenuated axial portions of the spadix (or lower portion of every spathe) concave on the inner side, convex and clawed on the back; secondary spathes 1·5–3 cm. long, unarmed or sparsely spinous, narrowly infundibuliform, attenuated at the base, finely striate, truncate at the mouth where produced at one side into a triangular point; compound male spikes 8–12 cm. long, bearing on each side 3–8 up to 10 arched secondary spikelets; these 1–2 cm. long; simple spikes (or larger spikelets) also arched distichously, inserted just at the mouth of their respective spathes, flattened, 2–5 cm. long, with 6–10 bifarious flowers on each side, spathels crowded, very broad, bracteiform, spoon-or boat-shaped, striately veined, acute, furfuraceous-ciliate; involucre cupular, not very deep, truncate, shorter than the spathel, scaly-ciliate at the margin, posticously bi-dentate. *Male flowers* ovate, 4 mm. long, rather blunt or sometimes acute, half enveloped by the spathels; the calyx striately veined, shortly and obtusely 3-lobate, frequently split irregularly; corolla one-third longer than the calyx, divided to a little below the middle into three oblong segments; stamens with filaments highly adnate to the tubular part of the corolla, subulate in their upper part, and with inflected tips; anthers lanceolate, versatile; rudimentary ovary represented by 3 pseudo-carpels which reach to about the middle of the anthers and form a clavate body. *Female spadix* similar to the male but simply decompound; partial inflorescences 20–30 cm. long, with 5–10 spikelets on each side, and terminating in a slender filiform caudate appendix; secondary spathes tubular, slightly enlarged above, truncate at the mouth, often aculeolate; spikelets inserted at the mouth of their own spathels, arched and strongly deflexed; the largest, the lowest, 5–6 cm. long with 8–10 flowers on each side; the upper ones gradually but not much smaller; spathels very short, very broadly infundibuliform, striately veined, entire, truncate, acute at one side; involucrophorum subdimidiately cupular, indistinctly bidentate and two-keeled next to the axis, attached at the base of the spathel above its own; involucre cupular, rather deep, truncate, its margin unequal, undulate or obscurely irregularly lobate or toothed; areola of the neuter flower lunate, sharply bordered. *Female flowers* small, ovate, 3·25–4 mm. long. *Fruiting perianth* not pedicelliform, cleft into 3 ovate, acute lobes; its corolla divided into three segments as long as those of the calyx, but slightly narrower; the calyx and corolla conspicuously rusty-furfuraceous. *Fruit* very broadly ovoid, suddenly contracted into a stout beak, 7–8 mm. broad, and 11 mm. long including the beak; scales in 18 series, almost shining, not or very faintly channelled along the middle, pale-yellowish, with obtuse reddish-brown tip, margins very finely erose and sometimes slightly tinged with the same colour as the tip. *Seed* (not seen perfectly mature) broadly ovate, convex and alveolate on the back, flattish with a circular and rather deep chalazal fovea on the raphal side; albumen equable; embryo situated a little above the base on the raphal side.

HABITAT.—Ceylon: in the southern district, *Thwaites* C. P. No. 3914; *Walker* in Herb. Kew.; Pasdun Korle, *Trimen;* Koti canal near Colombo, *Fergusson.*

OBSERVATIONS.—This *Calamus* shows marked affinities with the following allied species.

PLATE 65.—Calamus rivalis *Thw.* An intermediate portion of a leaf (seen from the lower surface) and lower portion of a male spadix with an entire partial inflorescence; from Thwaites' No. 3914 in Herb. Kew.

PLATE 66.—Calamus rivalis *Thw.* Leaf-sheath with the base of a leaf and partial inflorescence with almost ripe fruit, from Thwaites' No. 3914 in Herb. Calc.; two spikelets with ripe fruit and detached seeds, from the same number in Herb. De Candolle.

51. **Calamus Metzianus** Schlecht. in Linnæa, xxvi, (1853), 727; Walp. Ann. v, 856; Hook. f. Fl. Brit. Ind. vi, 462; Becc. in Rec. Bot. Surv. Ind. ii, 217.

C. rudentum (not of Lour.) Mart. Hist. Nat. Palm. iii, 340.

Description.—*Stem* and *leaf-sheaths* not seen, but very probably as in *C. rivalis. Leaves* not seen entire; rachis (of the upper portion) more or less furfuraceous, acutely trigonous, bifaced and naked above, armed throughout up to the base of the terminal leaflets with solitary claws, which have a pale, relatively long and suddenly deflexed point; leaflets numerous, equidistant, 3 cm. apart on each side, linear-lanceolate. narrowing to the base and gradually acuminate into a long and very slender apex; the largest and lowest of the portion of the leaf seen by me (a terminal portion, about 44 cm. long and probably one-third of the entire leaf) 25–27 cm. long, and 15 mm. in width, glabrous and almost of the same colour on both surfaces, with 3 costulæ of which the central is stronger than the side ones and is bristly spinulous from the middle upwards on both surfaces, but mainly beneath where the bristles are longer; other nerves naked; margins slightly thickened by a nerve running along and finely ciliately spinulous mainly towards the apex; upper leaflets gradually smaller, shorter and more bristly-penicillate than the others at the apex; the two of the terminal pair about 10 cm. long, very narrow and entirely free at the base. *Male spadix* . . . . . *Female spadix* elongate, flagelliform; primary spathes very long, narrow, very closely sheathing, armed with numerous small deflexed scattered aculei, obliquely truncate at the mouth and prolonged at one side into a short triangular point; the axial portion between two partial inflorescences (lower portion of the spathes) elongate, flat and smooth inside, convex and rather strongly armed with solitary and scattered or more or less aggregate and ternate black-tipped claws on the back; partial inflorescences inserted above the mouth of their respective spathes with a very distinct axillary callus, very elongate and with many distichous spikelets on each side; secondary spathes very narrowly tubular-infundibuliform, about 2 cm. long, smooth or with very few spinules upwards, narrow at the base, where flat on the inner side, obliquely truncate and entire at the mouth and extended at one side into a triangular point; spikelets attached just above the mouth of their own spathe, strongly arched and recurved; the largest, the lowest, 3·5–4 cm. long, with 8-9 flowers on each side; the uppermost shorter and with fewer flowers; spathels shortly and broadly infundibuliform, narrowed to the base a good deal, truncate and entire at the mouth, scarcely apiculate at one side, coriaceous, not or indistinctly nerved and scaly-furfuraceous externally; involucrophorum almost wholly immersed in its own spathel and attached at the base of the one above, subdimidiately cupular with unequal margin, not or indistinctly two-toothed and not very acutely two-keeled on the side next to the axis; involucre more or less cupular, with very unequal margin and often unilaterally evolute; areola of the neuter flower lunate, rather sharply bordered. *Female flowers* about 3 mm. long. *Fruiting perianth* not pedicelliform, its calyx split almost to the base into three ovate, rather thick and not very distinctly striately veined lobes; its corolla with the segments ovate, acute, narrower than the lobes of the calyx, but as long, rusty and scaly-furfuraceous externally.

Fruit broadly ovoid, very distinctly and suddenly contracted into about a 3 mm. long beak, 17 mm. in length, including the beak and the perianth and 11 mm. broad; scales light-yellowish, distinctly channelled along the middle, with very narrow scarious erosely toothed margin and fuscescent tip. *Seed* ovate, somewhat compressed, 9 mm. long, 7 mm. broad, 5 mm. thick, with the surface almost polished and of a brown-yellowish colour when freed from the dry friable dark integument, deeply alveolated on the back and with a rather deep oval chalazal fovea in the centre of the raphal side, from which radiate several furrows; albumen equable; embryo basal.

HABITAT.—Southern India in the Canara district, collected by the Rev. Metz.

OBSERVATIONS.—I have seen a very incomplete authentic specimen of this *Calamus* in the Berlin Herbarium labelled: "Hohenacker—Pl. Indiæ Orient. (Terra Canara); in montibus Ghats pr. Honore" (sic). The specimen is the upper portion of a leaf not fully expanded and a portion of a spadix with a few quite ripe fruits.

C. Metzianus seems to me only a continental form of *C. rivalis*, from which it differs in the larger fruit with the scales distinctly channelled along the middle.

In the Munich Herbarium I have seen the specimen referred by Martius to *C. rudentum* Lour. which I consider as belonging to *C. Metzianus ;* it is labelled "East India, Heyne" and probably comes from the same region as the type-specimen, the said botanist having made his collections chiefly in the southern districts of the Indian Peninsula. Heyne's specimen has a partial inflorescence 40 cm. long and bears 12–13 spikelets on each side; the secondary spathes are unarmed.

Should *C. Metzianus* prove identical with *C. rivalis*, the first name has the precedence, having been published many years before the second.

PLATE 67.—Calamus Metzianus *Schlecht.* Apex of a leaf and portion of the spadix, fruits and seeds, from Metz's authentic specimen in the Berlin Herbarium.

52. CALAMUS PSEUDO-RIVALIS Becc. sp. n.

DESCRIPTION.—Very probably scandent and of moderate size. *Leaf-sheaths* . . . . . *Leaves* . . . . . . *Male spadix* . . . . . *Female spadix* simply decompound, a few metres in length, with many partial inflorescences and prolonged into a clawed flagellum which in one specimen was two metres long; primary spathes very elongate, tubular, thinly woody, rather brittle, the lowest wanting; the medial and upper ones cylindraceous, slightly enlarged above where more or less opened on the ventral side, lengthened out at the apex into an ovate or lanceolate auriculiform rather acute limb; the lowest spathes amongst those present sprinkled with very many small, semiconic, almost tuberculiform prickles, which are less numerous in the upper ones; unsheathed and attenuated parts of the spadix between two partial inflorescences plano-convex or nearly concavo-convex in section at their base, rather strongly clawed on the convex or dorsal side; partial inflorescences relatively slender, very long, some of them one metre in length, with 10–12 spikelets on each side and terminated by a short (5–6 cm. long) unarmed and slender tail; secondary spathes tubular, slightly enlarged above, smooth or hardly spinulous, slightly obliquely truncate at the mouth and shortly produced at one side into a broad triangular apiculate point; spikelets more or less arched and recurved, inserted just at the mouth of their own spathe; the lowest 8–10 cm. long with 18–20 distichous flowers on each side; the upper ones not very much smaller; spathels short, broadly asymmetrically infundibuliform, produced at one side into a short and not very acute tip; involucrophorum short, dimidiately cupular or shaped like a swallow's nest, laterally adnate to the base of the spathel which is above its own; involucre cupular, truncate, faintly undulated or toothed on the margin; areola of the neuter flower depressedly lunate, sharply defined. *Female flowers* small (about 3 mm. long). *Fruiting perianth* not pedicelliform, the calyx parted down to the base into three lobes with its base acute and immersed in the involucre; the corolla as long as the calyx, but with narrower lobes; spathels, involucres and flowers rusty-furfuraceous. *Fruit* small, ovate, rounded at both ends, very suddenly contracted into a cylindric mucro which is 2 mm. long, on the whole 14–15 mm. long and 9 mm. broad; scales in 21 series, pale-yellowish, subshining, faintly channelled along the middle, usually of only one colour with short tip and paler obscurely erosely toothed margin. *Seed* ovate-globose, 8 mm. long, 6 mm. broad and 5 mm. thick, flattish on the raphal side, with a shallow chalazal fovea, coarsely pitted on the back; albumen equable; embryo almost basal or slightly lateral.

HABITAT.—The Nicobar Islands, where it was discovered by Mr. E. H. Man. The specimens were sent to me in August 1888 with the native name "Pentong," which name, however, I find applied also to other species.

OBSERVATIONS.—I have ventured to base the description of this species on the female spadix only owing to its great affinity with *C. rivalis* from which it differs in the much larger size of the spadix and in the scales of the fruit being entirely of one colour. The affinities of this species with *C. rivalis* is another proof of the similarity of the flora of Ceylon with that of the archipelagoes in the Bay of Bengal.

PLATE 68.—Calamus pseudo-rivalis *Becc.* Lower portion of the fruit-spadix with two entire partial inflorescences; seeds, one longitudinally cut through the embryo. (From Man's specimen in Herb. Becc.)

53. CALAMUS PSEUDO-TENUIS Becc. in Hook. f. Fl. Brit. Ind. vi, 445, and in Rec. Bot. Surv. Ind. ii, 204.

C. tenuis (not of Roxb.), Thw. Enum. Pl. Zeyl. 330 (excl. syn.).

DESCRIPTION.—Slender, scandent. *Sheathed stem* as thick as a finger. *Leaf-sheaths* sometimes flagelliferous, armed with variable spines, which are occasionally very short and almost tuberculiform or as much as 2 cm. in length, flat-subulate, horizontal or slightly deflexed, scattered and distant, or very crowded; one straight very long spine usually stands on each side of the mouth at the base of the ocrea. *Ocrea* very large, in young leaves even 10 cm. in length, fugaciously furfuraceous, brown, not spinous, pergamentaceous, entire, and not fibrous or filamentous at the margin. *Leaves* not cirriferous, probably about 1·5 m. long (judging from the portions seen by me); petiole short (about 15 cm. long), flat and smooth above, armed at the margins with long and straight spines, rounded below, where the spines are scattered, short and more or less hooked; rachis bifaced above, rounded beneath in its first portion where armed, especially at the sides, with some scattered, very long (even 4 cm.) needle-like, flat, straight, horizontal or deflexed spines which point in different directions, mostly solitary, sometimes geminate with a tendency to change along the middle into claws, especially towards the apex, where the rachis is flattish and the claws are more numerous and not seldom terminate in a rather long and suddenly deflexed point; leaflets pale-green and opaque when dry, slightly paler beneath, linear-lanceolate or narrowly lanceolate, gradually acuminate at the apex, where more or less indented on the lower margin, somewhat attenuate and suddenly contracted and plicate at the base, rather closely set, equidistant, almost regularly alternate or sub-opposite throughout the entire leaf; the larger ones, those near the base in vigorous specimens 35–45 cm. long and 2 cm. in width; the upper ones gradually shorter but of the same breadth, less acuminate, and more or less bristly-penicillate at the apex; the two of the terminal pair free at the base, much smaller than the others, 10–12 cm. long, 10–15 mm. broad; all with three more or less bristly-spinulous costæ above; the side costæ very weak; beneath only the mid-costa sparingly bristly, mainly near the apex; margins very appressedly spinulose or almost smooth; transverse veinlets rather faint, much interrupted. *Male spadix* very long, flagelliform, ultra-decompound, with many remote partial inflorescences; primary spathes tubular, very long, closely sheathing; the lowest flattened, acutely two-keeled, armed with scattered, straight, horizontal, mostly short spines; the intermediate ones slightly compressed, not keeled; the upper ones cylindraceous, obliquely truncate and entire at the mouth, where prolonged at one side into a short triangular point; armed in their upper part with broad-based deflexed prickles and on the back of their attenuated axial portion with strong half-whorled claws; partial inflorescences remote, very long (30–40 cm.) with 6–9 distichous compound spikes on each side; secondary spathes very narrowly tubular-infundibuliform, rather elongate, attenuate at the base, unarmed or nearly so, obliquely truncate at the mouth, where prolonged at one side into a triangular acute point, which is usually scaly-ciliate at the margins; compound spikes narrow, flexuose, arched downwards, 12–14 cm. long, with 12–15 very small (10–15 mm. long at most) very few-flowered, scorpioid spikelets; often the compound spikelets have the appearance of simple spikelets with a glomerule of flowers at each spathel; tertiary spathes tubular-infundibuliform; spathels very short, bracteiform, scale-like, concave, broadly ovate-acuminate; involucre usually shallowly cupular, truncate, posticously two-keeled, but sometimes divided into two ovate, acute, strongly striately veined scale-like bracts. *Male flowers* 2–10 on each side of the spikelets, very approximate, very small, about 3 mm. long, ovate; the calyx trilobate, striately veined outside; the corolla about twice as long as the calyx, divided down almost to the base into three oblong segments polished externally; the stamens united by their bases, subulate, shortly inflected at the apex when in bud, their anthers versatile, elongate-sagittate, rather acute; the rudimentary ovary very small, reaching little above the base of the filaments. *Female spadix* similar to the male one, but simply decompound; primary spathes as described above; partial inflorescences very long, 80–90 cm. long and sometimes more, with 8–9 distichous spikelets on each side, with a straight slender 8–10 cm. long aculeolate appendix at its apex; secondary spathes about 5 cm. long, sparsely aculeolate or smooth; attenuate at the base where concave on the inner side, convex externally and prolonged at the apex into a triangular acute point; spikelets flexuose, slender, patent and ultimately horizontal and slightly arched, not or very slightly callous in their axilla, inserted just at the mouth of their respective spathes, 15–27 cm. long, with 12–22 flowers on each side, or even shorter and with fewer flowers; spathels infundibuliform, truncate, smooth, acute at one side; involucrophorum very short subcupular, attached to and nearly excavate into the base of the spathel above its own; involucre small, shallowly cupular, slightly projecting from the involucrophorum; areola of the neuter flower depressedly lunate, callous, very sharply bordered. *Female flowers* small, 3 mm. long; the calyx divided into three subcoriaceous ovate-acute lobes; the corolla as long as the calyx, its segments ovate-acute; the filaments of the stamens highly connate by their bases, shortly dentiform in the free portion. *Neuter flowers* very similar to the fertile ones and only a little smaller. *Fruiting perianth* almost explanate (not pedicelliform) but with the calyx slightly callous at the base. *Fruit* (when not perfectly mature) 10 mm. long, 7 mm. broad, ovate or rather subobovoid, somewhat tapering towards the base and rather suddenly beaked at the apex; scales in 18 series, polished, convex, not channelled along the middle, straw-yellow at their base, with a broad chestnut-brown triangular point; margins finely erosely toothed. *Seed* (immature) subglobose; albumen equable.—The young parts of the spadix, the petiole and leaf-rachis are covered with a rusty-brown or tawny, easily removeable indumentum.

HABITAT.—Ceylon: in the hottest parts of the island, as at Balangodde and at Matette *Thwaites* C. P. No. 2335 in Herb. Kew. Petrop., etc. In the Indian Peninsula; near Madras, *G. Thomson;* Cochin, *Wight* No. 2759; Annamally and Nadooputtah, *Wight* No. 2758 in Herb. Kew., Petrop., Webb and Vindob. Anmode in N. Kanara, *Talbot* No. 2857 in Herb. Kew.; Gudalees Ghat, at 1650 m., *Gamble;* Goodaloor, 1400 m., Wynaad, *C. B. Clarke* in Herb. Becc.

OBSERVATIONS.—*C. pseudo-tenuis* is distinguished at once from *C. tenuis* by its explanate, not pedicelliform perianth; its nearest affinities are perhaps with *C. viminalis* Willd., from which it differs in the equidistant leaflets, clawed leaf-rachis, ovoid fruit, etc. I consider as type-specimens of *C. pseudo-tenuis* those from Ceylon distributed by Thwaites. The continental specimens may be considered as belonging to a special geographical form; they have more elongate male spadices and more remote and longer partial inflorescences; one of these is 90 cm. long with 9 compound spikes on each side, each spike bearing 30–40 spikelets in all. Another is only 45 cm. with 12 compound spikes. In the female spadix and in the leaves I cannot find the slightest difference between the continental and the insular specimens.

A partial inflorescence of a female spadix from Wight's Herbarium (No. 2758 in Herb. Petrop.) collected on the Nilgiris Hills in April 1847 is 1·5m. long and bears on each side 10 spikelets, of which the largest is 28 cm. in length. In the specimen from the Gudalees Ghat, collected by Gamble, the leaf-sheath, gibbous above, is about 2·5 cm. in diam., and shows traces of having been densely tawny-furfuraceous when young and is armed with straight, flat, subulate, pale, rather short, scattered or partially seriate spines; the petiole is 20 cm. long, remotely clawed beneath along the middle, and armed at the sides on both surfaces with some flat straight spines which are intermingled with others smaller and tuberculiform. At the base of the petiole near the ocrea stands a very long ascendent straight spine. Apparently not differing from the above is a specimen from Goodaloor given to me by Mr. C. B. Clarke, consisting in a male partial inflorescence and the apex of a leaf; this specimen, however, somewhat differs from the others in the very short secondary spikelets, hardly longer than the spathels and with only 2–3 flowers on each side, and these larger than in the Ceylon specimens.

C. pseudo-tenuis is distinguished in the group by the elongate leaves which have numerous equidistant, narrowly lanceolate 3-costate leaflets, the costæ being bristly-spinulous above; by the leaf-rachis armed beneath with straight spines in the lower part and with long-tipped claws upwards; by the partial inflorescences very elongate; by the male spadix with compound spikes which bear many very small, very short, almost rudimentary subscorpioid spikelets very similar to those of *C. viminalis;* by the female spikelets vermicular, long, flexuose; and by the fruit small, obovate, beaked, with scales yellow at the base and red-brown at the tip.

PLATE 69.—Calamus pseudo-tenuis *Becc.* An intermediate portion of a leaf (lower surface); portion of a male spadix and apex of a fruit spadix, from C. P. No. 2335 in Herb. Petrop.; portion of a female spadix in flower (on the right-hand side), from Wight, No. 2758 in Herb. Webb at Florence.

54. CALAMUS HOOKERIANUS Becc.

C. borneensis (not of Miq.) Becc. in Rec. Bot. Surv. Indi. ii, 205.

DESCRIPTION.—Probably very high-scandent, slender or of moderate size. *Leaf-sheaths* . . . . *Leaves* elongate, rather large (not seen entire); petiole . . . .; rachis acutely trigonous, bifaced and smooth above, in the terminal portion fugaciously tawny-lanuginose, flat below, where sub-regularly armed along the middle with short solitary claws; leaflets numerous, equidistant, not very closely set, rather regularly alternate, decreasing in length towards the apex, papyraceous, rather rigid, almost the same colour on both surfaces, narrowly linear-ensiform, shortly attenuate at the base, gradually acuminate towards the apex, 3-costulate above, the mid-costa more acute and prominent than the side costæ and all furnished with a few long brown bristles which are bulbous at the base; beneath, the mid-costa not very prominent, more or less bristly towards the apex, all the side nerves faint and smooth; the largest leaflets among those seen, which belong to the lower portion of what appears to be the upper third-part of the entire leaf, 30 cm. long and 13 mm. broad;

the upper ones gradually shorter and narrower, and with an almost obtuse and bristly-penicillate apex; the two of the terminal pair very narrow, quite free at the base; margins very minutely, very appressedly, and often indistinctly spinulous; transverse veinlets not very conspicuous, weak and much interrupted. *Male spadix* . . . . . *Female spadix* very long, slender, flagelliform, simply decompound, armed on the back of the attenuated unsheathed axial portion, between two partial inflorescences, with strong solitary aggregate or half-whorled claws; lower primary spathes . . . . .; upper primary spathes very long, narrow, cylindrical, tubular, very loosely sheathing, often split longitudinally upward, sprinkled with short aculei, truncate, entire and acute on one side at the mouth; partial inflorescences excessively long, in one specimen 1·5 m. long with 10 spikelets on each side, slender, and with a filiform aculeolate appendix at its apex; secondary spathes very long, very narrowly tubular-cylindraceous, suddenly narrowed near the base, very closely sheathing, decreasing in length from the base of the inflorescence upwards, the lowest 10 cm., the upper ones 5 cm. long, usually armed externally near the base with a few solitary or aggregate and subseriate claws, and in the upper part with very small tuberculiform spinules or almost unarmed, entire, obliquely truncate and acute at one side at the mouth; spikelets attached at, or a few millimetres above, the mouth of their respective spathe, horizontal or deflexed by a very conspicuous axillary callus, thickly filiform and rigid, zig-zag sinuous between the insertion of each flower; the largest ones, the lowest, 10–15 cm. long, with 10–15 distichous rather remote flowers on each side; the upper ones shorter, 4–5 cm. long with a proportionate number of flowers; spathels asymmetrically infundibuliform, 4–5 mm. long, not or very slightly veined, glabrous, truncate, entire, slightly prolonged at one side into a very short point; involucrophorum almost wholly exserted from its own spathel and laterally attached to the base of the one above, shallowly cupular, subdiscoid with a very short limb; involucre very shallowly cupular, moulded on the involucrophorum, irregularly and obscurely lobulate at the margin; areola of the neuter flower callous, lunate, very sharply bordered. *Female flowers* small, 3 mm. long. *Fruiting perianth* not distinctly forming a pedicel to the young fruit, but callous at the base; its calyx split down almost to the callous base into 3 ovate lobes; its corolla divided a little beyond the middle into 3 segments as long as the lobes of the calyx but a little narrower; stamens with filaments united by their bases and elongately triangular and subulate in the free portion. *Fruit* (very young) almost horizontally attached to the spikelets, subglobose-ovate, broadly conical at the top, 9–10 mm. long, 5 mm. in diam.; scales in 18 series, not channelled along the middle, yellowish brown at the base, chestnut-brown in the anterior portion, finely erosely toothed on the margins and mainly at the summit of its triangular acute tip. *Seed* (immature) subglobose, with equable albumen.

HABITAT.—The native country of this species is uncertain, as some of the specimens from which the description is derived are labelled as coming from Borneo, while others appear to have been collected on the Coromandel coast. The great similarity, however, of *C. Hookerianus* with *C. pseudo-tenuis* leads me to suppose India a more probable home than Borneo for the species.

OBSERVATIONS.—The description of this species is based upon some specimens of the Calcutta Herbarium labelled: "I. Borneo, Lobb," and consisting of the upper portion of a leaf and portions of a female spadix with immature fruit; the specimen of the leaf is glued on a separate sheet from that of the spadix, but I have no special reason to doubt of their belonging, leaf and spadix, to the same species; nevertheless I think it advisable to state that I consider the species founded only on the specimens of the female spadix. Besides the quoted specimens of the Calcutta Herbarium, I have seen some others, apparently of the same gathering, preserved at Kew and one in the Herbarium at Berlin, which bear the label "Madras—Herb. Ind. Or.—Hook. f. & Th." Another specimen of the female spadix not differing from the above is labelled in the Kew Herbarium: "Courtallum, Wight. Febr. 1835 (No. 1142);" this specimen is accompanied on the same sheet (No. 183) with a portion of a leaf different from that united to the fruit-spadix in the Calcutta Herbarium.

C. Hookerianus is distinguished from *C. pseudo-tenuis* by the fruiting perianth being more distinctly callous at the base and by the very long partial inflorescence with long secondary spathes and with numerous and remote spikelets which are pushed downwards by a very conspicuous axillary callus.

C. borneensis Miq. has been reduced by me to *C. javensis* var. *tetrastichus*, but owing to the uncertainty as to the native country of *C. Hookerianus* I have thought well not to keep the name *borneensis* for it.

PLATE 70.—Calamus Hookerianus *Becc.* Apex of a leaf (under surface); portions of a spadix with immature fruit, from the specimens in the Calcutta Herbarium mentioned above.

55. CALAMUS NEMATOSPADIX Becc. in Rec. Bot. Surv. Ind. ii, 204.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* 12–15 mm. in diam. *Leaf-sheath* flagelliferous, obliquely truncate at the mouth, finely striate longitudinally, rather densely armed with short (57 mm. long), flat, relatively broad, elongate-triangular, slightly deflexed, scattered or subseriate spines, which are fringed at the margins with scurfy scales. *Leaf-sheath flagella* very slender. *Ocrea* glabrous, very shortly liguliform and narrowly bordering the mouth of the sheaths. *Leaves* not cirriferous, 80–90 cm. long; petiole rather long, somewhat flattened, broadly and very superficially channelled above where entirely smooth, armed at the margins with remote short claws, of which some appear also on its convex back; rachis more or less fugaciously furfuraceous, bifaced and smooth above, convex beneath, where not very regularly armed along the middle with small, usually solitary claws; leaflets very variable in number, from 15 to 30 on each side, equidistant, linear-ensiform, 20–30 cm. long, 1–2 cm. broad, papyraceous, dull and concolorous on both surfaces, narrowed to the base, gradually acuminate into a very acute tip, which is ciliate at the sides and prolonged into a sometimes very slender long filament, subtricostulate, or with the mid-costa acute and smooth (or nearly so) above and a weaker spinulous costula on each side of it; beneath the mid-costa alone spinulous and the side nerves naked; transverse veinlets very minute, very approximate and much anastamosing; margins smooth in the lower portion and inconspicuously but very finely spinulous towards the apex, the upper leaflets shorter and not so acuminate as the others and bristly-penicillate; the two of the terminal pair free at the base. *Spadices* excessively slender and long, terminating in a very slender filiform flagellum, armed with very small weak solitary or ternate claws; primary spathes very long, very narrow and very strictly sheathing, striate longitudinally; the lowest 30–35 cm. long, much flattened, 5–6 mm. broad, with two very acute almost winged smooth edges, aculeolate along the middle of the dorsal side, obliquely truncate and naked at the mouth; upper primary spathes excessively narrow and long, finely aculeolate; axial portions between two partial inflorescences very long, filiform, powerfully armed with half-whorled or also single claws. *Male spadix* ultra-decompound, in one specimen 3 metres in length with very few (3–4) very remote, very long—even 90 cm. in length—partial inflorescences, which bear many remote (4–7cm. apart), compound spikes on each side, and end in a rather long filiform unarmed tail-like appendix; the compound spikes very slender and strict, horizontally attached above the mouth of their own spathe with a very distinct axillary callus at their axilla; the lowest, the largest, 10 cm. long, with 8–10 horizontal very short spikelets on each side; secondary spathes elongate, unarmed, very narrow, cylindraceous in their upper part, flattened and attenuated lower down, naked and acute at one side at the mouth; spikelets decreasing in size from the base of the compound spikes upwards, the lower ones the largest, 10–12 mm. long with 5–6 distichous flowers on each side, those of the apex reduced to having very few flowers or even only one; spathels bracteiform, broad, concave, very acute, strongly veined; involucre concave, acute at both sides. *Male flowers* very small, 2 mm. long, ovate, acute; the calyx strongly veined, with 3 broad acute lobes; the corolla twice as long as the calyx. *Female spadix* very much the same as the male, but simply decompound and with shorter partial inflorescences (of these the one seen by me 30 cm. long with 7 spikelets on each side); secondary spathes elongate, narrowly tubular, very slightly enlarged above, smooth or slightly spinulous, finely longitudinally striate, entire, truncate at the mouth and prolonged at one side into a triangular acute, naked tip, which is deflexed under the insertion of the spikelet; spikelets filiform, straight horizontal or slightly deflexed, attached just at the mouth of their own spathe with a distinct axillary callus, 4–5 cm. long with 8–12 flowers on each side; spathels cylindraceous at the base, suddenly enlarged into an infundibuliform strongly veined limb, truncate and entire at the mouth; involucrophorum and involucre small, laterally attached at the base of the spathel above their own, both almost explanate, the involucre with 2–3 acute lobes; areola of the neuter flower depressedly lunate. *Female flowers* very small, 1·5—2 mm. long. *Fruiting perianth* explanate; the calyx divided into 3 rather thick ovate acute parts; the segments of the corolla as long as the lobes of the calyx but narrower, acute, carinate along the middle. *Fruit* very small, pisiform, sphæric, very minutely mucronate, 6–7 mm. in diam.; scales in 12 series, relatively large, broader than long, very superficially channelled along the middle, light-yellowish at the base, bordered with reddish-brown, the tip acute, not prolonged, the margins almost entire. *Seed* very small, 4·5 mm. in diam., irregularly globular, rounded and coarsely alveolate on the back, flattish with very superficial chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—Borneo; at Sarawak, near Kuching, *Beccari* P. B. Nos. 1000, 2760, 1927.

OBSERVATIONS.—A very well marked species by the leaf-sheaths armed with flattened short broad fringed spines, equidistant subtricostulate ensiform leaflets and especially by the extraordinarily long and slender spadices with very small male and female flowers and very small round fruit not larger than a pea.—In drying the leaves acquire a chestnut-brown colour.

A specimen in the Calcutta Herbarium collected by Lobb, probably in Sarawak, apparently belongs to this species and bears the note: "Stem 3 to 4 feet; wet forests." This specimen agrees pretty well with my number 2760, but its leaf is more contracted and the spadix more robust.

PLATE 71.—Calamus nematospadix *Becc.* Portion of the stem with the base of a leaf and of a spadix (on the left upper corner of the plate); another portion of a stem with an entire male spadix; the upper part of a leaf (lower surface); portion of a fruit-spadix (on the left side) with an entire partial inflorescence; detached fruits and seeds; one of these longitudinally cut across the embryo.—From P. B. Nos. 1000, 2760, 1927 in Herb. Becc.

56. **CALAMUS AUSTRALIS** Mart. Hist. Nat. Palm. iii, 213 (1st edit.) and 342.; Kunth Enum. Pl. iii, 212; Walp. Ann. iii, 491 and v, 832.; H. Wendl. and Drude in Linnæa, xxxix, (1875), 197; Benth. Fl. Austr. vii, 134.—F. von Muell. Syst. Cens. Austr. Pl. 119; H. Wendl. in Kerch. Les Palm., 235; Becc. Malesia, i, 88.

C. obstruens F. v. Muell. Fragm. v, 48; Bailey Queensl. Fl. 1685.

C. Jaboolum Bailey, Bot. Bull. xiii (non vidi), and Queensl. Fl. 1686.

DESCRIPTION.—High scandent, rather slender or of moderate size. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* flagelliferous, not gibbous above, obliquely truncate at the mouth, covered when young, as are the petiole and rachis of the leaves and the spathes, with a rusty-grey detachable cottony indumentum and entirely clothed with very slender, brittle, flexible blackish or fuscescent, spreading, 1–2 cm. long, criniform spiculæ, which are denser and erect at the mouth. *Leaf-sheath flagella* with the basal spathe flattened, two-edged and furnished at the sides with long spiculæ. *Leaves* not cirriferous, rather short, about 60 cm. in length; the petiole short, 4–5 cm. long, convex beneath, where almost unarmed or more or less furnished with small claws, flattish above, where more or less densely covered with spiculæ like those of the leaf-sheaths; rachis bifaced and smooth above, roundish in the first portion, flat upwards, and irregularly armed throughout beneath along the middle and in the lower portion, also at the sides with rather small solitary or slightly aggregate claws; leaflets not very numerous, 10–18 on each side, alternate or almost opposite, 2–5 cm. apart, subequidistant, papyraceous, rigidulous, shining, somewhat plicate longitudinally, subconcolorous and destitute of hairs spinules or bristles on both surfaces, lanceolate or narrowly lanceolate, rather suddenly contracted at their insertion on the rachis, where often distinctly callous mainly in the lower leaflets, gradually acuminate into a subulate not bristly or ciliate apex, more or less deeply indented on the lower margin near the summit and terminating in a long (2–3 cm.), very slender, brittle and deciduous thread; all the leaflets are of about the same size, 15–27 cm. long, and 20–28 mm. broad, the lowest ones hardly smaller than those of the middle; the upper ones suddenly shorter than the others; the two of the terminal pair 6–10 cm. long, obtuse and often distinctly bidentate at the apex; mid-costa rather acute and prominent in the upper face; secondary nerves slender and only one on each side of the mid-costa more conspicuous than the others, but not so as to render the surface distinctly 3-costate; beneath all nerves less distinct than above; transverse veinlets fine, rather numerous and distinct; margins quite smooth or very sparingly appressedly spinulous. *Male spadix* fugaciously tawny-furfuraceous, elongate flagelliform, pendulous, ultra-decompound with a long, clawed flagellum at its summit, strongly armed in the attenuated basal portions between two partial inflorescences with half-whorled black-tipped claws; primary spathes very elongate, tubular, cylindric, very closely sheathing, rather densely aculeolate in their upper part, obliquely truncate at the mouth where often somewhat split longitudinally and prolonged at one side into a triangular hispid point; partial inflorescences elongate, large and diffuse, as much as 60 cm. long, arising erect from inside the mouth of their own spathe and then spreading, terminating in a short filiform closely sheathed caudate unarmed appendix, and bearing in their apical portion a few simple spikelets and in the lower one a few secondary branches, which latter are 8–12 cm. long with 4–9 spikelets on each side; secondary spathes about 2 cm. long, very narrowly tubular-infundibuliform, closely sheathing, narrowed at the base, unarmed, finely striately veined longitudinally, entirely green and not withered at the mouth where obliquely truncate, densely ciliated with fine paleolæ and prolonged at one side into a triangular acute point; tertiary spathes infundibuliform, striately veined, sprinkled with small greyish scales; spikelets horizontal or deflexed, callous at their upper axilla, inserted just above the mouth of their own spathe, complanate, pectinate; those of the upper part of the inflorescences 3–5 cm. long with 12–15 distichous very approximate flowers on each side; those of the branches or compound spikes 2 cm. at most, with about 10 flowers on each side; spathels very short, concave, subbracteiform, with their apex acute and deflexed, striately veined, ciliolate and sprinkled with small grey scales; involucre almost flat, transversely evolute, acute at both sides. *Male flowers* very small, 2 mm. long, ovate or subobovate, rounded and obtusely apiculate at the top; the calyx with a short striately veined tube with 3 very broad triangular acute lobes; the corolla twice as long as the calyx or even longer. *Female spadix* simply decompound, the one seen entire with 6 partial inflorescences and about 2 metres in length including a slender aculeolate apical flagellum of 40 cm. in length; lowest primary spathe flattened, two-edged, rather densely covered with spiculae like those of the leaf-sheaths; the other spathes like those of the male spadix; largest partial inflorescences 25–50 cm. long, bearing on each side 8–12 spikelets, these 5–15 cm. long, flexuose, vermicular, narrowed and acute at the summit, with 8–14 flowers on each side; spathels broadly infundibuliform, somewhat narrowed at the base, finely striately veined, truncate at the mouth and prolonged at one side into a triangular acute point; involucrophorum almost included in its own spathel and attached at the base of the one above, sub-cupular, acutely bidentate and two-keeled and deeply lunately emarginate on the side next to the axis; involucre sub-cupular, saymmetrically evolute, bidentate and also lunately emarginate on the side next to the axis; areola of the neuter flower broadly lunate, very acute at both sides and sharply bordered. *Female flowers* small, 3·5 mm. long, ovate, acute, somewhat ventricose when in bud; the calyx deeply divided into 3 ovate, concave, acute, strongly striately veined lobes; the corolla with segments smooth outside, slightly longer than the calyx. *Fruiting perianth* explanate. *Fruit* subsphæric, about 14 mm. in diam., minutely apiculate; scales light-yellowish, subshining, slightly channelled along the middle, with a very narrow rusty intramarginal line, and a scarious erosely toothed margin. *Seed* subglobose-ovoid, about 9 mm. long and 7·5 mm. in diameter, with an even, not pitted surface and a rather deep chalazal fovea placed above the centre on the raphal side; albumen equable; embryo basal.

HABITAT.—Australia: N. E. Queensland, where it seems common, Cape Grafton, *Martius*; Fitzroy Island, *MacGillivray*; Voyage of the *Rattlesnake*, June 1848 in Herb. Kew; Rockingham Bay, *Dallachy* in Herb. Becc. from F. v. Mueller; Upper Barron River, *Diels* No. 8364 in Herb. Berol.; Russell River, Harvey Creek, *Diels* No. 8554 in Herb. Berol.

OBSERVATIONS.—In some of the more apparent characters this approaches *C. pseudo-tenuis* of Ceylon and Lower India. It is distinguished amongst the species of the group by its densely criniferous leaf-sheaths, short leaves with subequidistant lanceolate leaflets, which are narrowed and suddenly plicate at the base, unicostate or plicate subtricostulate with the nerves smooth on both surfaces. I have referred to *C. australis*, the *C. Jaboolum* of Bailey after inspection of the specimens collected by Diels and so named in the Herbarium at Berlin. Bailey's *C. Moti* is an allied, but distinct species.

PLATE 72.—Calamus australis *Mart.* Apex of a leaf (under surface); a partial male inflorescence and a female spikelet, from Macgillivray's specimens in Herb. Kew.; an intermediate portion of a leaf seen from the upper surface and a fruit, from Dallachy's specimen in Herb. Beccari.

57. CALAMUS MOTI Bailey, Bot. Bull. xiii, (non vidi) and Queens. Fl. 1685.

DESCRIPTION.—*Sheathed stem* about 2·5 cm. in diam. *Leaf-sheaths* cylindraceous, very obliquely truncate at the mouth, very densely armed with not very large (10–15 mm. long) spreading fulvous acicular spines, which are confluent by their irregularly and very closely seriate rather swollen bases. *Ocrea* very short, at first truncate, later forming a narrow border to the mouth of the sheath where it is armed with crowded slender fulvescent spiculæ. *Leaf-sheath flagella* . . . . *Leaves* large, not cirriferous (one entire 1·8 m. in length); petiole covered (like the rachis) with dark furfuraceous scales, stout, about 20 cm. long, almost perfectly cylindrical in its lower portion, narrowly and deeply channelled upwards above, furnished at the sides with small prickles (some of these appearing also at the sides of the rachis) and armed beneath along the middle with rather strong, straight, about 1 cm. long, slightly deflexed aculei which extend lower down along the back of the sheath and higher up pass into the rachis where they are transformed into smalll claws; the claws disappear in the intermediate portion of the leaf and reappear, but much smaller, in its upper part; above (the rachis) is acutely bifaced with the angle smooth and the faces rather concave, and is furnished at the sides with some very small aculei; leaflets very numerous, very regularly equidistant from the base to the top; in the intermediate portion about 3 cm. apart on each side, closer towards the apex, alternate or subopposite, papyraceous, rigidulous, subconcolorous on both surfaces, slightly paler underneath, subshining above, elongate-lanceolate or ensiform, slightly attenuate at the base, where suddenly plicate, and not callous at their insertion, very gradually long-acuminate into a subulate very slender tip, which is sparingly bristly spinulous at the sides, with 3 slender costæ, which are all furnished above with brown bristles (these scarcer on the mid-costa) and naked beneath; transverse veinlets sharp, rather remote and interrupted; margins finely and very appressedly spinulous, slightly thickened by a marginal nerve; all leaflets almost of the same size, those a little above the base, the largest, 40–45 cm. long, 20–25 mm. broad, only those near the summit narrower and shorter; the two of the terminal pair very narrow and free at the base. *Male spadix* . . . . . . *Female spadix* simply decompound, elongate, terminating in a very long and robust flagellum (2·8 m. long in one specimen) which is strongly armed with robust, very broad-based black-tipped claws; primary spathes . . . . .; partial inflorescences elongate-paniculate, the one seen by me 38 cm. long with 8 spikelets on each side; secondary spathes tubular-infundibuliform, closely sheathing, somewhat narrowed at the base, unarmed, indistinctly striately veined, truncate at the mouth, prolonged at one side into a short erect point; spikelets cylindraceous, rather thick, inserted just outside the mouth of their own spathe and arising erect from this and then arched downwards, not distinctly callous at their upper axilla; the largest, the lower ones, 5–6 cm. long, with 5–6 flowers on each side, the upper ones shorter; spathels tubular-infundibuliform, slightly narrowed to the base, horizontally truncate and entire at the mouth, prolonged at one side into a short triangular point, involucrophorum exsert from its own spathel and laterally attached at the base of the one above, almost regularly cupular not callous at its axilla, slightly bidentate on the side next to the axis; involucre cupular, truncate, slightly lunately emarginate and bidentate on the side of the neuter flower; areola of the neuter flower distinctly lunate, rather concave, with sharp borders. *Fruiting perianth* not pedicelliform. *Fruit* subsphæric, about 12 mm. in diam., suddenly topped by a rather large mucro; scales in 17–18 series, yellowish-brown, rather shining, slightly channelled along the middle with a very dark intramarginal line, the short tip and margin erosely toothed. *Seed* subdimidiately globular, 8 mm. long, with uneven but not pitted surface, very convex on the back and with a very deep circular chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—Australia: N. E. Queensland, on argillaceous ground in damp places of the primeval forests on the middle and upper Barron River, at about 500 metres above the level of the sea, *Diels* No. 8388 in Herb. Berol.

OBSERVATIONS.—I have seen of this the terminal portion of a fruit spadix with a single partial inflorescence and the upper part of a plant with two leaves and their sheaths: these are not gibbous above and are without any trace of a flagellum, but the plant probably climbs by the aid of the long-clawed flagellum which terminates the spadix. *C. Moti* possibly may not differ from *C. radicalis* which, however, is so imperfectly known that an exact comparison of the two is actually impossible. In the leaves of *C. Moti* I have not found any spiny bristles in the upper face of the rachis nor spinules on the costæ of the under surface of the leaflets, but otherwise the leaflets of the two plants are very much like each other.

The characteristic marks of *C. Moti* are the leaf-sheaths densely armed with subseriate spreading spines; the large leaves with terete petiole and numerous large ensiform leaflets which are bristly on 3 costæ above; and the spadix with a very long and strong terminal clawed flagellum.

PLATE 73.— Calamus Moti *Bailey.* The upper part of stem with the bases of leaves; an intermediate portion of a leaf; the summit of a fruit spadix with a partial inflorescence and the entire terminal flagellum.—From Diels's specimen in Herb. Berol.

58. **CALAMUS RADICALIS** H. Wendl. & Drude in Linnæa, xxxix, (1875), 195; Benth. Fl. Austr. vii, 135 (reduced to *C. Muellerii*); Becc. Malesia, i, 88, and in Rec. Bot. Surv. Ind. ii, 204; H. Wendl. in Kerch. Les Palmiers, 237.

DESCRIPTION.—Scandent (Wendland & Drude). *Stem.* . . . . . *Leaf-sheath* flagelliferous and densely aculeate (Wendland & Drude). *Leaves* not cirriferous, with numerous equidistant leaflets (Wendland & Drude); in the small portion seen by me probably from the middle the rachis is fugaciously furfuraceous, flattish below, where armed along the middle with small solitary claws, bifaced above, where furnished on the acute angle with some very slender bristly spinules; leaflets alternate, 3 cm. apart, elongate-lanceolate or ensiform, rather suddenly plicate at the base, gradually long-acuminate into a subulate bristly-spinulous apex, 45 cm. long and 20–22 mm. broad, green even when dry, rather shining on both surfaces, hardly paler beneath thinly papyraceous, subtricostulate mainly near the base in the upper surface, where the mid-costa is acute and raised, and the side costæ are very slender, evanescent and undistinguishable from some other secondary nerves towards the apex; the 3 costulæ are furnished above with a few long dark bristles; on the undersurface the mid-costa is not prominent, and on this as well as on 1–2 slender nerves on each side of it are some very small appressed spinules easily overlooked; margins with many very short approximate appressed spinules; lower margins slightly thickened by a slender nerve; transverse veinlets rather sharp, rather distant, much interrupted.—Other parts unknown.

HABITAT.—N. E. Queensland: to the north of Port Mackey, discovered by Nernst.

OBSERVATIONS.—This *Calamus* has been described by its authors as stoloniferous, high scandent, with non-cirriferous leaves, which bear numerous equidistant leaflets and with flagelliferous densely aculeate leaf-sheaths; but the description is based on the specimen of only one leaf, a fragment of which I received from the late Baron Ferd. von Mueller. With such imperfect material it is very difficult to point out the affinities of this species, though very probably it will range near *C australis.* Certainly it cannot be referred to *C. Muellerii,* as was supposed by Bentham, nor to any other known Australian *Calamus,* except to the recently described *C. Moti* Bailey. A leaf of a *Calamus* gathered by Miss E. Bauer on the Bloomfield River Queensland, and also communicated to me by von Mueller probably belongs to *C. radicalis.*

59. CALAMUS ZEBRINUS Becc. Malesia, iii, 59, and Rec. Bot. Surv. Ind. ii, 204

DESCRIPTION.—High scandent. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous above, ornamented with very many crowded horizontally or obliquely seriate sinuous subannular or interrupted narrowly lamelliform ridges, which are further finely toothed-spinulous on their crest. *Leaf-sheath flagella* very long, compressed in the basal portion, where serrulate or furnished with approximate very small spinules on the edges, and cylindraceous upwards where irregularly armed with half-whorled or scattered claws. *Ocrea* deciduous. *Leaves* rather large, 1.7 m long, not cirriferous; petiole rather elongate (18 cm. long), flat above where densely armed all over the surface as well as on the margins with short straight spines, rounded and smooth beneath; rachis broadly channelled on each side in its lower portion above (where are inserted the leaflets), and bifaced with acute and smooth angle in its upper part; beneath the rachis is regularly and closely armed at the sides and along the middle with short stout claws, which are solitary in the lower and intermediate portion and are ternate near the summit; leaflets very numerous, equidistant, patent, very closely and very regularly set, almost always opposite, very narrow linear, very long-acuminate, green and concolourous on both surfaces, papyraceous, subtricostulate, the mid-costa acute and the side costæ slender but distinct above faint beneath, the 3 rather closely and minutely bristly on both surfaces; the largest leaflets 25–30 cm. long, 1 cm. broad, the uppermost gradually shorter, the two of the terminal pair small and narrow, free at the base; transverse veinlets not very conspicuous and much interrupted; margins very finely ciliolate.—Other parts unknown.

HABITAT.—N. E. New Guinea; at Ramoi, *Beccari* P. P. No. 416.

OBSERVATIONS.—This species does not appear allied to any other, but is perhaps to *C. serrulatus;* though seen only in a sterile condition, it is very well marked by the peculiar ornamentation of the leaf-sheaths, and the numerous very narrow equidistan. leaflets with 3 bristly nerves on both surfaces.

PLATE 74.—Calamus zebrinus *Becc.* Portion of the sheathed stem and leaf from Beccari P. P. No. 416.

60. CALAMUS SERRULATUS Becc. Malesia, iii, 59, and in Rec. Bot. Surv. Ind. ii, 204.

DESCRIPTION.—Scandent, when with the sheaths on as thick as a man's finger. *Leaf-sheaths* not or indistinctly gibbous above, slightly clavate or somewhat gradually enlarged towards their upper part, very obliquely truncate at the mouth, and gradually passing into the petiole, armed with not many solitary scattered horizontal or somewhat deflexed, very acuminate, straight, 5–15 mm. long spines, which have a rather broad and swollen base and leave above them a distinct impression on the sheath. *Ocrea* indistinct or probably deciduous. *Leaf-sheath flagella* slender, filiform, smooth and flattened in their basal portion, aculeolate upwards. *Leaves* rather large, 1·5 mm. long; petiole rather long (30 cm.), broadly channelled above, remotely aculeolate at the margins, round and smooth beneath; rachis rounded beneath, where in its lower portion clawed at the sides, and almost unarmed along the middle, which is furnished with rather crowded solitary claws in its upper third part; above the rachis is broadly bifaced with its upper angle formed by two fine, raised, parallel, very approximate lines which originate from the mid-costa of every leaflet decurring along the centre of the rachis; leaflets patent, numerous, equidistant, very closely set, alternate or almost opposite, papyraceous, rigidulous, green, concolorous and shining on both surfaces, narrow-linear, very slightly narrowed and suddenly plicate at the base, not very gradually acuminate at the summit into a filamentose apex, with a mid-costa very acute above and slender beneath, but minutely and closely spinulous on both surfaces, and one slender nerve (on each side of it) remotely bristly above and naked beneath; all leaflets about the same size, 15-16 cm. long and 8–10 mm. broad, only a few near the summit shorter; the two of the terminal pair the smallest, free at the base; transverse veinlets very fine, much interrupted; margins very finely and closely spinulous-serrate.—Other parts unknown.

HABITAT.—N. W. New Guinea; at Ramoi, *Beccari*, P. P. No. 419.

OBSERVATIONS.—This seems allied to *C. zebrinus*. It is distinct in the group by its subclavate sparingly spinous leaf-sheaths; by the leaves with a long petiole, which is smooth beneath; by the very numerous equidistant linear leaflets which have conspicuously finely and closely spinulous-serrate margins and the mid-costa finely spinulous on both surfaces and one slender nerve on each side of it; this is bristly above and naked beneath.

PLATE 75.—Calamus serrulatus *Becc.* An intermediate portion of the sheathed stem with its leaf, from Beccari P. P. No. 419.

61. CALAMUS REINWARDTII Mart. Hist. Nat. Palm. iii, 335, t. 112 (excl. fig. 15?); Walp. Ann. iii, 485 and v, 830; Miq. Fl. Ind. Bat. iii, 118, and De Palmis 27; Teysm. Cat. Hort. Bog. 75; Becc. in Rec. Bot. Surv. Ind. ii, 205.

C. viminalis var. *α Reinwardtii* (excl. var. *β amplus*) Mart. l. c., 205 (1st edit.); Kunth Enum. Plant. iii, 205;

C. Reinwardtii var. *α pauciflorus* and var. *β amplus* (excl. the syn. of Rumph. according to Mart. himself, l. c., 336, under *C. Buroensis*) Mart. l. c., 2nd edit.; 208;

C. Reinwardtii Bl.? (sic) Zoll. Syst. Verzeichn. 78. and Pl. Jav. Exsicc. No. 2639;

C. Reinwardtii var. *β ruptilis* Bl. Rumphia, iii, 52.

C. rudentum (not of Lour.) Herb. Reinw. (partly) Bl., l. c.

Description.—Scandent. *Sheathed stem* 1·5–2·5 cm. in diam. *Leaf-sheaths* densely armed with straight elongate light-coloured spines. *Leaves* 1–1·5 m. long; petiole elongate, channelled above, rounded beneath, armed, chiefly at the margins, with scattered horizontal or spreading, elongate-subulate, rather strong spines which are intermingled with others, smaller, short-conical and having a tendency to change into claws; rachis bifaced above, armed beneath with irregularly scattered, rather long, straight, slightly deflexed solitary spines sometimes intermingled with small claws; the spines of the petiole and rachis light-coloured like those of the sheaths; leaflets rather numerous, subequidistant, 2–4 cm. apart, linear-ensiform, thinly papyraceous but rather rigid, concolorous on both surfaces, shining above, attenuate at the base, gradually subulately acuminate into a bristly apex, distinctly tricostate, the 3 costæ equally spinulous above, beneath the mid-costa spinulous and not very prominent, and the other nerves faint and naked; transverse veinlets not very crowded, much interrupted and rather sharp; margins finely and appressedly spinulous; the largest leaflets, those a little above the base, 25–35 cm. long, 15–20 mm. broad; the two of the terminal pair free at the base, shorter but not narrower, more obtuse and more bristly at the apex than the others. *Male spadix* ultradecompound in its lower portion, simply decompound upwards elongate-flagelliform, 1–2 m. long, ending in a slender aculeolate flagellum and bearing 5–8 remote partial inflorescences, which are inserted by means of a distinct axillary callus with a distinct transversal rima at, or a little above or shortly inside, the mouth of their own spathe; upper primary spathes very long, narrowly tubular, cylindraceous, very slightly enlarged above, prickly chiefly externally in their attenuated part, often split longitudinally at their summit and terminating in a narrow lanceolate limb, which is often withered and marcescent at the margins and at the apex; the lower partial inflorescences (the largest) 30–35 cm. long, branched again at their base; the upper ones gradually shorter and with a variable number of spikelets; secondary spathes narrowly tubular-infundibuliform, unarmed, obliquely truncate and ciliate at the mouth and prolonged at one side into a triangular acute point; this usually withered and ultimately marcescent. *Male spikelets* 2–4 cm. long, slender, filiform, patent or horizontal, more or less arched downwards, attached at the mouth of their own spathe and callous at the axilla; spathels very shortly asymmetrically infundibuliform, apiculate at one side, strongly veined, entire and ciliate at the margin; involucre cupular, rather shallow, exserted from its own spathel and laterally adnate to the base of the one above. *Male flowers* horizontally inserted. *Female spadix* more robust than the male one, simply decompound, flagelliform, elongate, with not many very remote partial inflorescences; primary and secondary spathes as in the male spadix; partial inflorescences issuing erect from the split summit of their respective spathe, then more or less spreading, rather rigid; the lower ones, the largest, as much as 45 cm. long and in luxuriant specimens with 15–17 spikelets on each side; the upper ones gradually shorter, 15–20 cm. long, with 4–8 spikelets on each side; spikelets rather rigid, horizontally inserted with a distinct axillary callus, more or less arched and often deflexed; the lower ones, in vigorous specimens, as much as 12–13 cm. in length with 25–30 flowers on each side, but usually 6–7 cm. long with proportionally fewer flowers; spathels suddenly expanded into a very short, broadly infundibuliform, truncate, obtuse and coarsely veined limb; involucrophorum cupular, shallow, exserted from its own spathel and laterally attached to the cylindraceous base of its own; involucre cupular, truncate, entire, slightly exceeding the involucrophorum, entire or undulate at the margin; areola of the neuter flower lunate, rather large, sharply bordered. *Female flowers* horizontally bifarious, small, 3 mm. long; the calyx with a rather flat and callous base, not distinctly veined, with 3 road acute teeth; the segments of the corolla as long as but narrower than the teeth of the calyx. *Fruiting perianth* shortly pedicelliform. *Fruit* subglobular, about 10 mm. in diam., suddenly contracted into a narrow and rather long beak; scales in 15 series, slightly channelled along the middle, light-coloured or substramineous with a paler, scarious, finely erosely toothed margin, with a triangular not very appressed or subsquarrose point. *Seed* globular.

HABITAT.—Java. The authentic specimens of this species do not bear any indication as to the exact locality where they were collected by Reinwardt; those referred by Blume to his variety *ruptilis* are said to come from the Preanger on the south coast of the island. Zollinger's specimens No. 2639 (in Herb. Boiss. and Deless.), according to the collector, ought to come from the foot of Mount Lamongan in the province of Probolingo in East Java, but probably they were taken from plants transported to the garden at Buitenzorg, since, regarding the quoted locality, the collector adds:—"ex H. B. (Horto Bogoriensi). Eadem sp.?" Martius says that this species occurs also in Borneo and Celebes, but I have seen no specimens from these countries, and I think the case hardly possible. The native name in Java is "Rotang Tjetjeret" (Zollinger).

OBSERVATIONS.—*C. Reinwardtii* is closely related to *C. heteroideus*, from which it differs in its larger size and chiefly in the fruit which is almost sphæric, but at the same time distinctly beaked and with fewer scales. When the spines of the leaf-rachis are elongate and deflexed, as very often is the case, the leaves recall those of *C. viminalis*, but in *C. Reinwardtii* the spines are solitary, while they are often ternate in *C. viminalis*. The figure 15 representing the fruit of *C. Reinwardtii* in Martius' plate 112 probably belongs to *C. heteroideus*; it was this figure which induced me to believe that no difference could be found between *C. Reinwardtii* and *C. heteroideus* as I had not seen the real fruit of the first, when I published my Systematic Enumeration of the species of the genus Calamus in the *Records of the Botanical Survey of India*.

PLATE 76.—Calamus Reinwardtii *Mart.* An entire leaf (probably a radical one); an intermediate portion of a leaf from the upper part of the plant (under surface); portion of a spadix with an entire partial inflorescence and bearing immature fruit.—From a specimen in the Vienna Herbarium, apparently belonging to Zollinger No. 2639.

62. CALAMUS HETEROIDEUS Bl. Rumphia, iii, 46, and vars. *ε procerus*, *η refractus*, *ο conjugatus*, *ζ spissus*, l. c., 47; Mart. Hist. Nat. Palm. iii, 335; Walp. Ann. iii, 485 and v, 830; Miq. Fl. Ind. Bat. iii, 119, and Pl. Jungh., 160, and De Palm., 27; Kurz. Veg. Bangka in Natuurk. Tijds. Ned. Ind., xxvii, (1864), 218.

C. viminalis (not of Willd.) Bl. in Roem. & Schult. Syst. Veget. xii, 1328; Bl. Rumphia, iii, pl. 150 and pl. 163B.

Calamus sp. (*C. anceps* Bl.?) Zoll. Syst. Verzeichn. 79 and Exsicc. No. 783.
C. Reinwardtii var. *heteroideus* Becc. in Rec. Bot. Surv. Ind. ii, 205.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 1–1·5 cm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous above, covered, when young, with a tawny-furfuraceous, easily detachable indumentum, more or less densely armed with flat, polished, light-coloured, subulate, scattered (never seriate), very unequal, short or 1–2 cm. long, horizontal or slightly deflexed spines. *Leaf-sheath flagella* slender, sometimes bearing a rudimentary spikelet, armed with solitary slender, almost unilaterally set claws. *Ocrea* liguliform, elongate (even 6–7 cm.), tubular at first, later split anticously, membranous, ultimately exsuccous, and more or less lacerate, smooth or prickly chiefly at the base. *Leaves* 50–90 cm. long, not cirriferous; petiole 10–25 cm. long, rounded beneath, more or less channelled above, occasionally smooth, but usually armed at the margins and often beneath with not many broad-based, scattered, rigid, 1–3 cm. long, subulate, solitary or geminate horizontal spines, which are sometimes intermingled with smaller spines that have a tendency to change into claws; rachis in its lower portion armed beneath along the middle with a few solitary straight or suddenly deflexed elongate spines, which are often intermingled with long-tipped claws; the latter more numerous and smaller (to the exclusion of other kinds of spines) in its upper portion; the spines of the petiole and rachis light-coloured like those of the sheaths; leaflets 12–22 on each side, subequidistant, 2–4 cm. apart, thinly papyraceous, subshining above, slightly paler beneath, linear-ensiform, attenuate at the base, subulately acuminate into a bristly apex, distinctly tri-costate, the 3 costae spinulous above, usually naked beneath or with a few spinules on the mid-costa; transverse veinlets rather distant, sharp, much interrupted; margins appressedly spinulous, the largest leaflets, those a little above the base, 23–25 cm. long, 13–15 mm. broad; the two of the terminal pair smaller than the others, free at the base. *Male spadix* ultradecompound in its lower portion, simply decompound upwards, elongate, delicate, flagelliform. *Female spadix* more robust than the male one, simply decompound, slender, elongate (0·8–1 m. long), flagelliform, with few (4–5) very remote partial inflorescences and prolonged at the summit into a slender filiform aculeate appendix; primary spathes very closely sheathing, very narrow and very elongate; the lowest flattened, with acute and spinous edges; the upper ones cylindraceous, more or less prickly, chiefly externally, in their lower attenuated part, and with a short limb at their summit; partial inflorescences 15–20 cm. long, ascendent, with 4–8 spikelets on each side, inserted above the mouth of their respective spathes with a distinct axillary callus; secondary spathes elongate-infundibuliform, striately veined, unarmed or aculeolate, truncate at the mouth, prolonged at one side into a short point; spikelets horizontal or slightly deflexed with a distinct axillary callus; the lower ones, the largest, 3–5 cm. long with 8–10 bifarious, not very approximate flowers on each side; the upper ones somewhat shorter; spathels shortly and broadly infundibuliform, coarsely veined, very shortly prolonged at one side into an acute point; involucrophorum exsert from its own spathel and laterally attached to the attenuated part of the one above, shallow-cupular; involucre slightly exceeding the involucrophorum, cupular, often with irregular margin; areola of the neuter flower more or less distinctly lunate. *Female flowers* small (3 mm. long), the calyx callous at the base, strongly veined, divided down to about the middle into 3 broadly triangular acute lobes; the segments of the corolla as long as but narrower than the lobes of the calyx. *Fruiting perianth* shortly pedicelliform. *Fruit* small, ovate-ellipsoid, 12–14 mm. long, 9 mm. broad, sometimes slightly tapering towards the base, suddenly contracted at the apex into a narrow 2 mm. long beak; scales in 18–19 series, light-coloured or stramineous, shining, slightly convex, very indistinctly channelled along the middle with paler marginal line, sometimes tinged with reddish-brown, the margins finely erosely toothed, the point not very appressed, obtuse. *Seed* oblong, convex and sinuously grooved on the back, with an oblong chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—Probably the commonest *Calamus* in Java. It is especially frequent in the forests of the largest volcanos at an elevation of 600–1,500 metres. Blume mentions the VAR. β. from the Salak and the Gede; the VAR. γ from the Tijhidung, the Burangrang and the Tankuwanprahu; the VAR. ϵ from the Burangrang and the Patuha. To *C. heteroideus* must be referred the specimens distributed by Zollinger under No. 783 and gathered on the Salak. Dr. Boerlage has forwarded to me a good specimen collected at Tjibodas. Kurz mentions also Bangka as a native country for *C. heteroideus*.

This *Calamus* is known in Java by the Malay names: "Rotang Lilin, R. Leilan, R. Tratas, R. Tjatjing" and the Sundaneese: "Hooy Korot" or "H. Korrot or "H. Gorrot, H. Gurrung, H. Tjatjieng, H. Sege, H. Mukka." It is much employed as cords for ligatures and for many other uses, but is much less esteemed than other species imported from Borneo and Sumatra.

OBSERVATIONS.—Of *C. heteroideus* I have seen rather numerous, but always very fragmentary specimens. It differs from *C. Reinwardtii* in its smaller dimensions, but chiefly in the shape of the fruit, which is subglobular with a distinct and rather long beak in *C. Reinwardtii*, and ellipsoid in *C. heteroideus*; further, the scales of the first have a triangular acute point, and are disposed in 15 longitudinal series, while in the second the point is less elongate and obtuse and the series are 18–19. As I have already pointed out when speaking of *C. Reinwardtii*, the fruit represented in the fig. 15, pl. 112 of Martius exactly corresponds to that of *C. heteroideus*. *C. heteroideus* is a mountain plant, while *C. Reinwardtii* appears to be its representative in the low land of Java. *C. heteroideus* seems a very polymorphic species, but the varieties proposed by Blume are probably to be considered simply as trophic forms.

PLATE 77.—Calamus heteroideus *Bl.* Leaf-sheath with the base of a leaf and a fruit-spadix; an intermediate portion of a leaf; a summit of a leaf (upper surface); a spikelet with almost mature fruit.—All from Dr. Boerlage's specimen mentioned above.

CALAMUS HETEROIDEUS var. DEPAUPERATUS Becc.

DESCRIPTION.—More delicate in every part than the type. *Sheathed stem* very sender, 7–10 mm. in diam. *Leaf-sheaths* moderately armed with slender or short and scattered spines. *Leaves* with the petiole channelled above, rounded and unarmed below; rachis unarmed or nearly so; leaflets with 3 costæ, which are spinulous above and quite naked underneath. *Spadices* very slender, sparingly spinulous.

HABITAT.—The specimens on which I have based this variety come from Java. They were given by Blume to Schultes and are now preserved in the Herbaria of St. Petersburg and Munich.

CALAMUS HETEROIDEUS var. PALLENS Becc.

C. Reinwardtii var. *pallens* Becc. in Rec. Bot. Surv. Ind. ii, 205.

C. pallens Bl. Rumphia iii, 51; Mart. Hist. Nat. Palm. iii, 341; Walp. Ann. iii, 490 and v, 832; Miq. Fl. Ind. Bat. iii, 134; H. Wendl. in Kerch. Les Palm. 237.

DESCRIPTION.—Slender. *Leaves* more delicate than in the type, not or sometimes subcirriferous; leaflets narrow, minutely and closely spinulous on the three costæ above and only on the mid-costa beneath; rachis armed throughout or at least in its upper portion with very short solitary claws. *Male spadix* elongate, very slender, filiform, very lax, partially supradecompound; partial inflorescences few, remote; spikelets very slender, filiform, 2–4 cm. long, horizontal or deflexed; spathels shortly infundibuliform, coarsely veined, prolonged at one side into a subulate ciliate point, which spreads and subtends its flower; involucre cupular, exsert from its own spathel and laterally attached to the base of the one above. *Male flowers* pectinate, or perfectly flatly bifarious and subhorizontally inserted, 1–2 mm. apart, 3–3·5 mm. long, cylindraceous-oblong, 1 mm. thick, apiculate at the summit; the calyx shortly tubular, strongly striately veined, divided down almost to the middle into three broad triangular acute lobes; the corolla more than twice as long as the calyx, divided almost to the base into three oblong, navicular, apiculate segments, which are polished outside and striately-channelled inside; the filaments of the stamens united by their bases, subulate, inflected at the apex when in the bud; anthers sagittate; rudimentary pistil columnar, shortly 3-toothed at its apex.

HABITAT.—Java: on the south side of the volcano Tjerimai in the province of Cheribon. It is called by the natives "Hooy Korrot," a name applied also to *C. heteroideus* from which they do not consider it to be different (Bl).

OBSERVATIONS.—I have seen an authentic specimen of this variety which I cannot consider specifically distinct from *C. heteroideus.* One leaf had the rachis produced at the apex into a filiform very delicate cirrus between the terminal pair of leaflets. I have seen also a specimen of the type *C. heteroideus* bearing a leaf with a rudimentary cirrus.

PLATE 78.—Calamus heteroideus *Bl.* VAR. pallens *Becc.* An intermediate portion (under surface); portion of a male spadix in flower.—From an authentic specimen of Blume in the Leyden Herbarium.

63. **Calamus opacus** Bl. Rumphia, iii, 50; Mart. Hist. Nat. Palm. iii, 336; Walp. Ann. iii, 486, and v, 830; Miq. Fl. Ind. Bat. iii, 123, and in Journ. de Bot. Neerl. i, 21. and Prodr. Fl. Sum. 256 and De Palmis 27; Becc. in Rec. Bot. Surv. Ind. ii, 205.

Description.—Slender, scandent. *Sheathed stem*, cm. in diam. *Leaf-sheaths* pubescent, armed with straight, flattened, subulate, pale, unequal, short or 10–15 mm. long and often obliquely inserted spines. *Leaf-sheath flagella* elongate, armed with scattered solitary or somewhat irregularly aggregate aculei. *Ocrea* 1–1·5 cm. long, anticously split and with irregular margins. *Leaves* not cirriferous, about 80 cm. long, petiole 15 cm. in length, flat above, armed at the margins with straight spines, rounded below where furnished with scattered claws; rachis sparsely floccose-furfuraceous, bifaced and smooth above and armed beneath, from the middle to the top, with solitary claws which have a black, straight and not very long tip, and in the lower portion along the middle and at the sides with slender, rather approximate (2–3 cm. apart) claws; leaflets very numerous (in one leaf 27 on each side) almost equidistant, narrowly ensiform, subulately acuminate; the intermediate ones the largest, 25 cm. long and 13–16 mm. broad; the upper ones shorter; the two of the terminal pair free at the base, all tricostulate; the 3 costæ sprinkled above with bristles (3–4 mm. long), which beneath are confined to the mid-costa; margins very appressedly spinulous; transverse veinlets very irregular. *Male spadix* . . . . . *Female spadix* elongate-flagelliform; primary spathes very narrow, cylindraceous, very closely sheathing, rather densely armed with small scattered claws; partial inflorescences remote (in one specimen 30 cm. long with 8–9 spikelets on each side); spikelets inserted just at the mouth of their own spathes with a distinct axillary callus, spreading or horizontal, slightly curved, the larger ones, the lowest, 6–7 cm. long, with 10–11 flowers on each side; secondary spathes elongate, tubular-infundibuliform, very narrow at the base, unarmed, truncate at the mouth, prolonged at one side into a triangular acute point; spathels infundibuliform, 4 mm. long, truncate, smooth, not striate; involucrophorum cupular, laterally adnate to the base of the spathel above its own; areola of the neuter flower callous, lunate. *Fruiting perianth* very shortly pedicelliform, the calyx trilobate, callous at the base, not striate outside; the corolla with ovate-lanceolate acute segments as long as the calyx. *Fruit* broadly ellipsoid, 17–18 mm. long and 13–14 mm. in diam., suddenly and shortly beaked; scales in 18 series, faintly channelled along the middle, fuscescent or umber-brown with a much darker marginal line which is broader towards the rather elongate point, the margins erosely toothed. *Seed* oblong, 11·5 mm. long and 8–8·5 mm. thick, convex and coarsely pitted or grooved on the back and with an almost round chalazal fovea in the centre of the raphal side; albumen equable; embryo basal.—All parts of the plant acquire a brown colour when dry.

Habitat.—Blume founded this species on specimens collected by Praetorius in Sumatra, where it has been found again by me at about 1,700 metres above the sea on Mount Galang.

Observations.—I have written the description of the stem and leaves mainly from my specimens, but I have also seen a portion of a leaf and of the spadix with mature fruit of the typical specimens of Blume.

C. opacus is closely related to *C. Reinwardtii*, but is distinct in the not striate and tubular spathels and in the larger fruit; the leaflets are hardly distinguishable from those of *C. Reinwardtii*.

PLATE 79.—Calamus opacus *Bl.* Portion of the stem with leaf-bases and an entire flagellum; lower portion of a leaf. The above from a sterile specimen collected by me in Sumatra. Upper portion of a leaf and an entire partial inflorescence with two mature fruits; a seed from the raphal side. From an authentic specimen of Blume in the Leyden Herbarium.

64. CALAMUS LURIDUS Becc. in Hook. A. Fl. Brit. Ind. vi, 445 and in Rec. Bot Surv. Ind. ii, 206.

DESCRIPTION.—Scandent, rather slender, of a dirty dark greenish-brown colour in the different parts when dry. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* densely armed with unequal, flattened, rather short (1 cm. long), schistaceous, broad-based, spreading or slightly deflexed spines, which are solitary and scattered or somewhat approximate in horizontal lines. *Leaf-sheath flagella* very long (1·5–2 m.), very powerfully and densely clawed; the lowest spathe flattened, 2-edged and very prickly. *Leaves* not cirriferous, more than 1 m. in length; petiole rather short (10–15 cm. long), flattish above, prickly at the margins and more or less also beneath; rachis sparsely armed beneath in its lower portion with many small scattered solitary claws, which are larger and confined only to along the middle in its upper portion where it is bifaced above; leaflets equidistant, remote (4–6 cm. apart), not very numerous, papyraceous, shining above, almost of the same colour on both surfaces, ensiform, gradually attenuate at the base, long-acuminate into a subulate bristly-ciliate apex, with 3 very distinct costæ which are bristly-spinulous above, naked and less prominent beneath; the largest, the intermediate ones, 35–40 cm. long, 1·5–3·5 cm. broad; the upper ones somewhat shorter; the two of the terminal pair 20–25 cm. long, shortly connate at the base and bristly-penicillate at the apex; margins very inconspicuously appressedly spinulous; transverse veinlets very fine, sinuous, interrupted. *Male spadix*. . . . . . *Female spadix* more or less supradecompound (always ?), very long, flagelliform, with many remote monoecious (always ?), partial inflorescences, which have the spikelets with every female flower accompanied as usual by a neuter one in their lower part and only male flowers on the terminal spikelets or on some of the secondary ones; the inflorescences are pyramidate, arise erect from their spathe and then are spreading and arched, branched at the base and with simple spikelets in their upper part, and terminate in a spikelet (with male flowers) larger than the side ones; the largest inflorescences 30–40 cm. long, with 2–3 branchlets on each side near the base and 8–10 simple spikelets (also on each side) upwards; upper primary spathes tubular-cylindraceous, very elongate, closely sheathing, strongly striately veined, longitudinally armed chiefly on the outer side with numerous scattered claws, naked at the mouth and prolonged at one side into a triangular acute point; secondary spathes elongate-infundibuliform, rather considerably narrowed to the base, finely striately veined, longitudinally unarmed or furnished with 1–2 straggling prickles on the back, truncate, entire, and finely ciliolate (at least when young) at the mouth, prolonged at one side into an elongate, triangular, subulate tip, which is hairy-penicillate at its apex; male and female spikelets the same, attached just at the mouth of their own spathe, slightly callous at the axilla, spreading, arched rather slender; the largest simple spikelets, the lowest, 5-7 cm. long with 12-15 flowers on each side, the upper ones shorter; the branchlets 8—10 cm. long with 2—4 spikelets on each side and a larger terminal one; spathels short, very broadly infundibuliform, much narrowed to the base, strongly striately veined, sprinkled with very small deciduous silvery scales, sometimes subscabrid, truncate and entire at the mouth, prolonged at one side into a triangular, acute, patent or deflexed point; involucrophorum propped by its own spathel and attached at the base of that above its own, slightly concave, irregular, scale-like, lobate; involucre also slightly concave, irregular and more or less lobate, strongly veined areola of the neuter flower rather large, spongy, callous in the centre with acute and irregular borders. *Male flowers* oblong, obtuse, 4·5 mm. long; the calyx with a short and broad tube, callous at the base, very strongly striately veined; its teeth acute, short and broad; corolla twice as long as the calyx. *Female flowers* broadly ovoid, with an almost flat and callous base and a conic point; the calyx as in the male flowers; the corolla slightly longer than the calyx. *Fruiting perianth* shortly pedicelliform. *Fruit* broadly obovoid, very suddenly and distinctly beaked, 11 mm. long, 8 mm. broad when not quite mature; scales in 15—16 series, light greenish brown, faintly channelled along the middle, with pale scarious erosely toothed margin. *Seed* with equable albumen.

HABITAT.—The Malayan Peninsula, in the district of Perak, *Scortechini;* at Larut, *King's collector*, Nos. 2647, 6284, 6400; on the summit of Gunong Malakka, Herb. Calc. No. 7203. A very incomplete specimen collected by Ridley in the wild part of the Botanic Garden of Singapore apparently belongs to *C. luridus.*

OBSERVATIONS.—The flowering spadix which I have described is one of Scortechini's from Perak, and this is more robust than those of other collectors; it is supradecompound and bears male flowers on the terminal spikelets and on some of those of the branchlets; otherwise, the greatest number of its flowers are female. Perhaps in more delicate specimens the female spadix is not always supradecompound, but even in the partial inflorescence with fruit represented in our plate the lowest spikelets appear branched near their base. I have not seen spadices with male flowers only.

C. luridus seems allied to *C. Reinwardtii* from which it is distinguished by its not very numerous, rather remote, equidistant, ensiform, distinctly and acutely tricostate leaflets, the costæ being almost of the same strength, bristly-spinulous above and smooth beneath. I am unable to establish if the supradecompound and monoecious spadices are a constant character of this species.

PLATE 80.—Calamus luridus *Becc.* Summit of a leaf (upper surface) and leaf-sheath with the base of a spadix and of a leaf, from No. 2647 in Herb. Calc.; partial inflorescence with almost ripe fruit, from No. 6284 in Herb. Calc.; portion of a monoecious spadix in flower and an intermediate portion of a leaf (lower surface), from Scortechini's specimen in Herb. Becc.

65. Calamus sabensis Becc. sp. n.

Description.—Slender, scandent. *Sheathed stem* about 15 mm. in diam. *Leafsheaths* gibbous above, armed (in the small portion seen by me) with scattered horizontal spines. *Leaves* apparently about 60 cm. long (not seen entire by me), petiole very short (about 2 cm. long in one specimen), with short prickles all round; rachis armed beneath in its first portion with very small black-tipped scattered claws; leaflets very few, remote, inequidistant, lanceolate, almost equally gradually narrowed to both ends, acute at the base, acuminate at the summit, 30–32 cm. long, 28–34 mm. broad, rather firmly papyraceous, concolorous, glabrous, spineless and without bristles on both surfaces, distinctly 3- and near the base 5-costulate; transverse veinlets much interrupted and numerous, rather sharp on the upper surface; margins minutely and appressedly spinulous. *Male spadix* . . . . . *Female spadix* simply decompound, slender, very elongate, flagelliform, with very remote partial inflorescences; upper primary spathes cylindraceous, very elongate, very densely armed in their upper part with very small scattered deflexed prickles, truncate at the mouth, where prolonged at one side into a short triangular point, slightly and gradually narrowed to the base into a flat and slender, dorsally prickly axial part; partial inflorescences inserted at the mouth of their respective spathes with a distinct axillary callus and rima, very elongate and slender, 85 cm. long in one specimen, with 17 (in all) remotely alternate spikelets; secondary spathes 4–5 cm. long, narrowly tubular, subclavate or very slightly enlarged above, narrowed to the base where flat with acute margin on the inner side, truncate and ciliate at the mouth, very shortly prolonged at one side into a broadly triangular point, with very few and very small hooked prickles here and there, but especially near the summit; spikelets spreading, inserted at the mouth of their respective spathes with a distinct axillary callus; the lower ones the largest, 5–5·5 cm. long with 15–16 flatly bifarious flowers on each side, the upper ones not much shorter; spathels very shortly and broadly unilaterally infundibuliform or concave, subcymbiform, prolonged at one side into a triangular acute tip, finely veined, sometimes subscabrid; involucrophorum almost exsert from its own spathel and laterally attached to the base of the one above; involucre cupular, almost entire or bidentate on the side of the neuter flower, of which the areola is very conspicuous, subcircular, often concave, with very acute borders. *Female flowers* small, about 3 mm. long; the calyx divided down to about the middle into 3 triangular acute teeth; the segments of the corolla narrower than the teeth of the calyx and slightly longer. *Fruiting perianth* distinctly pedicelliform. *Fruit* ovoid-elliptic, 12 mm. long, including the perianth and the beak, 8 mm. broad; scales in 18 longitudinal series, not channelled along the middle, brownish, rather dull with a narrow very dark shining marginal line; this broader towards the slightly prolonged and rather acute point. *Seed* oblong, coarsely and deeply pitted; albumen with a superficial intrusion of the integument; embryo basal.—The leaves acquire a tobacco-brown colour in herbarium specimens.

Habitat.—North Borneo or Saba: Bongaya River in Labuk bay, *Ridley* December 1897, No. 9038 in Herb. Kew.

Observations.—It resembles *C. scabridulus* a good deal and, following the natural affinities, it ought to be placed next to it, but the secondary spathes are not scabrid.

It approaches also *C. luridus*, but the form of the partial inflorescences is quite different.

PLATE 81.—Calamus sabensis *Becc.* The entire type specimen consisting of the basal portion of a leaf and of a portion of spadix with an entire partial inflorescence bearing almost mature fruit.

66. CALAMUS DELICATULUS Thw. Enum. Pl. Zeyl. 330 and Addenda 431; Hook. f. Fl. Brit. Ind. vi, 446; Becc. in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—High scandent, slender or of moderate size. *Sheathed stem* 18–20 mm. in diam. *Leaf-sheaths* flagelliferous, not or slightly gibbous above, armed with very many and very crowded straight, flat, subulate, horizontal or slightly deflexed, unequal, solitary or somewhat confluent, but not seriate spines, which often are covered with dark floccose scurf; near the mouth of the sheath the spines are more numerous and longer than elsewhere, some of them attaining the length of 6–7 cm., and are straight, slender, whitish and brittle, whereas others are flat and subulate and even bristle-like. *Leaf-sheath flagella* filiform, very slender. *Ocrea* rather elongate, papyraceous, exsuccous and entirely covered with spines as on the sheaths. *Leaves* ·7–1 m. in length; petiole very short (3–5 cm. long) and like a large portion of the basal part of the rachis, flat above and convex beneath, where the rachis is armed throughout with short, conical, straight or slightly recurved spines; these stronger and longer along the middle and changed in the upper part of the leaf into solitary and rather approximate claws; leaflets numerous, equidistant, alternate or subopposite, narrowly ensiform or linear-ensiform, alternate at the base, acuminate to a very acute and bristly subulate apex, subshining and almost concolorous on both surfaces; the mid-costa acute and, like one slender nerve on each side of it, bristly-spinulous above; beneath all nerves indistinct and only the mid-costa furnished with a few long bristles; margins very minutely and appressedly bristly; the largest leaflets, those a little above the base, 25–28 cm. in length, and 12–15 mm. broad; the upper ones gradually shorter but not narrower; the two of the terminal pair one-half or two-thirds smaller than the others and very slightly confluent by their bases or almost free. *Male spadix* very slender, partially supradecompound, very elongate, flagelliform; primary spathes very long and narrow, the lowest compressed and covered with spines similar to those of the sheaths; the others cylindraceous, excessively narrow and long, very closely sheathing, entire and obliquely truncate at the mouth, more or less densely armed, especially on the outer side, with slender claws; partial inflorescences filiform, very long and delicate, 30–70 cm. long, inserted above the mouth of their own spathe and very distinctly callous at their upper axilla, partially decompound, viz., bearing at the base some secondary branches (these 10–15 cm. long) and upwards some very remote and very slender spikelets; secondary spathes elongate; the lower ones 5–6 cm. long, the others shorter, very narrow and very closely sheathing, tubular-cylindraceous in their upper part, very attenuate at the base, unarmed or sparingly spinulous, truncate at the mouth, where ciliate-filamentose at first, then naked, acute at one side; spikelets very delicate, filiform, horizontally inserted with a distinct axillary callus a few millimetres above the mouth of their respective spathe; the larger ones 5–6 cm. long (rarely more) and bearing 12–14 exactly horizontal, distichous, remote (3–4 mm. apart) flowers on each side; spathels subcylindraceous-infundibuliform, slightly enlarged above, distinctly apiculate on one side, strongly striately veined in their upper part, smooth at the base; involucre laterally adnate to the base (in the smooth portion) of the spathel above its own, shallowly cupular, strongly veined at the sides, posticously bidentate and callous at the axilla next to the axis. *Male flowers* glabrous, subcylindraceous, rounded but apiculate at the top, 3 mm. long, 1 mm. thick; the calyx strongly striately veined, subventricose or urceolate, callous at the base, its teeth very short, broad, acute, 3–5-veined; the corolla two and a half times as long as the calyx, narrower than this, oblong-clavate, polished outside, divided down almost to the base into 3 narrow, acute segments; filaments of the stamens united by their bases, subulate, with inflected apices when in the bud; anthers sagittate, acute; rudimentary ovary distinctly evolute, conical, striate-channelled by the pressure of the stamens and crowned by three subulate stigmas. *Female spadix* similar to the male but simply decompound; spikelets bearing on each side 10–12 horizontal flowers, these 3–4 mm. apart; spathels as in the male spikelets; involucrophorum laterally adnate and almost hollowed into the base of the spathel above its own, with a very short limb and a vestige of a transverse rima in the axilla next to the axis; involucre rather shallow, moulded on the involucrophorum and hardly distinguishable from this, with entire or faintly lobulate undulate margin; areola of the neuter flower flattish, callous, transversely ellipsoid or nearly round with sharply defined borders. *Fruit* globose, somewhat longer than broad, 8–10 mm. in diam.; scales in 15 series, of a pale-straw colour, shining, with an elegant and narrow chestnut-brown intramarginal line, their apex somewhat prolonged, obtuse, and rather coarsely erosely toothed. *Seed*, when perfectly ripe and divested of its thin integument, stony, shining and brown-ochraceous, 8 mm. long, 6 mm. thick, rounded at the summit, flattish at the base, convex and irregularly facetted on the back (the facets slightly concave), flattish on the raphal side with a small circular and deep chalazal fovea from whence irradiate a few short irregular furrows; albumen equable; embryo basal.—The young parts and chiefly the leaf-sheaths and the leaf-rachis are more or less tawny-furfuraceous.

HABITAT.—Ceylon: Hinidoon Pattoo, in the district of Galle, *Thwaites* C. P. No. 3159.

OBSERVATIONS.—A very slender and delicate species, distinct in the group by the following characters: leaflets numerous, linear-ensiform, equidistant, unicostate, the costa and one slender nerve on each side of it bristly-spinulous above, beneath only the costa furnished with a few long bristles; spadices and spathes excessively slender; male and female flowers horizontal, 3–4 mm. apart; fruit small, globose; seed facetted.

PLATE 82.—Calamus delicatulus *Thw.* Leaf-sheath bearing a male spadix and the base of a leaf; summit of a leaf (undersurface); and from Thwaites C. P. No. 3159 in St. Petersb. Herb.

67. CALAMUS HELFERIANUS Kurz in Journ. As. Soc. Beng. xliii, 2 (1874), 213, and For. Fl. Brit. Burma ii, 521; Hook. f. Fl. Brit. Ind. vi, 446; Becc. in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—Scandent and slender. *Stem*. . . . . . ; *Leaf-sheaths* . . . . . *Leaves* not cirriferous, rather large (not seen entire); petiole. . . . . ; rachis fugaciously rusty-furfuraceous, acute and bifaced above in its upper portion, roundish, polished and unarmed below, or sometimes showing here and there vestiges of small claws; leaflets rather numerous, in the basal portion of the rachis distinctly grouped in fascicles of 2–5 on one side, equidistant and in each fascicle disposed in one plane and not pointing different ways; the fascicles with vacant spaces 8–10 cm. long amongst them, often opposite and towards the summit of the leaf more distant and with fewer leaflets than lower down; furthermore the leaflets are very narrowly lanceolate or linear-lanceolate, or narrowly ensiform, sometimes very elongate, attenuate at the base and gradually acuminate into a very acute and subulate apex; this more obtuse and somewhat bristly-penicillate in the upper ones, subshining, green even when dry, sub-5-costulate; the 3 central costae, of which that of the middle slightly stronger than the side ones, sparingly spinulous, the other two more slender, naked or here and there spinulous; lower surface slightly paler than the upper one with all nerves faint and naked; margins with very small appressed spinules visible only under the lens; transverse veinlets sinuous, much interrupted and not very crowded; the largest leaflets in one specimen 30–32 cm. long and 15 mm. broad, in another 20 cm. long, 13–15 mm. broad; the two of the terminal pair a third shorter than the others, but of the same breadth or slightly narrower, free at the base, opposite or slightly decurrent one on the other and of unequal size. *Male spadix* (judging from the portions seen by me) flagelliform, lax, slender, very elongate, ultradecompound, glabrous in every part; lowest primary spathe flattened, elongate, acutely two-edged, unarmed, produced at the summit into a lanceolate point; upper primary spathes tubular, very elongate, cylindraceous or slightly compressed, very strictly sheathing, long and gradually narrowed to the base, where flat on the inner side, sparingly armed on the back along the middle with rather long and slender aculei, and prolonged at the summit into a short, lanceolate, acute, herbaceous limb keeled on the back; partial inflorescences slender and long, the lower ones the largest, in one specimen up to 50 cm. long, with 10–20 remote branches, of which 2–3 near the base are 10–12 cm. long, branched again and with spikelets right and left; the upper ones undivided and with simple spikelets; secondary spathes longitudinally finely striately veined, green, tubular, elongate, slightly enlarged above, truncate and glabrous at the mouth, indistinctly apiculate on one side; spikelets of the secondary branches 3–4 cm. long, the others 4–6 cm. long, attached above the mouth of their own spathe with a distinct axillary callus, slender, straight or flexuose, spreading or deflexed, bearing distichously on each side 5–10 exactly horizontal rather remote (1·5–2 mm. apart) flowers; spathels cylindraceous at the base with a very shortly infundibuliform truncate limb, apiculate at one side; involucre laterally adnate outside its own spathe to the base of the one above and almost hollowed into this, shallowly cupular with very short circular entire limb. *Male flowers* ovate-oblong, obtusely apiculate, 4 mm. long; calyx coriaceous, short, campanulate, not veined outside, its teeth very broad, triangular, superficial, rather acute; corolla almost twice as long as the calyx, divided down almost to the base into three oblong, acute segments, subshining outside; filaments of the stamens shortly united at the base, subulate with inflected apices in the bud; anthers versatile, elongate; rudimentary ovary very short, formed by three very small, acute, connivent bodies. *Female spadix* (not seen entire) simply decompound; partial inflorescences 15–30 cm. long, with very few remote spikelets on each side; secondary spathes as in the male spadix but larger; spikelets spreading or recurved, inserted above the mouth of their own spathe and callous at their upper axilla, 8–12 cm. long; their axis cylindraceous and slightly sinuous, with 14–15 horizontally inserted distichous and very remote (5–7 mm. apart) flowers on each side; spathels as in the male spikelets; involucrophorum laterally adnate outside its own spathel at the base of the one above and nearly hollowed into this, shallowly cupular with a very short sub-entire limb; involucre moulded on the involucrophorum and not exceeding this, with entire or faintly undulate lobulate margin; areola of the neuter flower depressed-lunate, very distinctly tumescent and callous. *Female flowers* about 4 mm. long, conical, acute, very broad at the base; calyx very thick, callous at the base, shortly 3-toothed; stamens forming by the connate bases of the filaments an urceolum which is crowned by 6 very broad and short teeth; sterile anthers very broadly sagittate. *Fruit* unknown.

HABITAT.—Tenasserim (or Andaman Islands?) where collected by *Helfer* (male specimens, No. 6389; fem. sp. No. 6393 in Herb. Kew). In the Calcutta Herbarium a male specimen, also of Helfer, bears the label: Tenasserim No. 6589.

OBSERVATIONS.—Apparently very closely related to *C. delicatulus* of Ceylon; but in this the leaflets are not fascicled, the spikelets are more slender and the flowers smaller. The position of this species however remains uncertain, the fruit not being known. The characteristics of *C. Helferianus* are: the leaflets very distinctly grouped, equidistant and disposed on one plane in each group, linear-lanceolate, sub-5-costulate, the 3 costulae of the centre spinulous above and smooth beneath; the ♂ and ♀ spadices very long and very slender; the spathes very narrow and long and very closely sheathing; the ♀ and ♂ flowers horizontally inserted, the ♂ 1·5–2 mm. apart, the ♀ more remote or 5–7 mm. apart.

A specimen of a leaf from Helfer's No. 6389 in Herb. Petrop. is more robust than the others, the groups are formed by 8 leaflets on each side and some of them are 40 cm. long and 2·5 cm. broad.

PLATE 83.—Calamus Helferianus *Kurz.* Male partial inflorescences with top of a leaf, from Helfer's No. 6589 in the Calcutta Herb.; the portion of the leaf with two fascicles of leaflets and a female partial inflorescence (on the right-hand side) from Helfer's No. 6393 in Herb. Kew.

68. CALAMUS NICOBARICUS Becc. in Hook. f. Fl. Brit. Ind. vi, 446 and in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—Very slender. *Sheathed stem* 7–14 mm. in diam.; naked canes 5–10 mm. in diam. with a polished vernicose yellowish surface, the internodes 10–25 cm. long. *Leaf-sheaths* very light-coloured (when dry), slightly gibbous above, obliquely truncate at the mouth, furfuraceous when young, then glabrous, densely armed with numerous, unequal, scattered, elastic, flat, thin, relatively large, deflexed spines, which sometimes are 2·5 cm. long and 2–3 mm. broad at their base; these intermingled with others much smaller or even tuberculiform, all entirely light-coloured. *Leaf-sheath* *flagella* filiform, very slender, with the lowest spathe flattened and acutely two-edged, sparsely aculeolate. *Ocrea* very short, truncate, glabrescent, smooth. *Leaves* not cirriferous, 60–90 cm. long; petiole (in leaves of the upper part of adult plants) short or very short, broadly channelled above, armed at the sides with unequal spines, of which a few are long, straight and spreading, and beneath with short deflexed aculei; rachis smooth and acutely bifaced above, armed beneath along the middle with a line of solitary claws; leaflets numerous, equidistant, 15-25 mm. apart, thinly papyraceous, linear-ensiform, narrowed to the base, very gradually acuminate into a long subulate apex, which is bristly-spinulous at the sides, subshining and concolorous on both surfaces, unicostate, the mid-costa sparsely bristly-spinulous on both surfaces, but only near the summit; side-nerves slender, always naked; margins finely and appressedly spinulous; transverse veinlets very distinct, much interrupted; the largest leaflets, those a little above the base, 18–25 cm. long, 10–12 mm. broad; the upper ones shorter but not narrower; the two of the terminal pair the smallest, quite free at the base.—Other parts unknown.

HABITAT.—The Great Nicobar, whence it was sent to me in August 1886 by *Mr. E. H. Man*, who informed me that it is much used by the natives and that it is in great demand by ship-traders who take it to the Straits, and that it is called "Tchye" by the Nicobarese.

OBSERVATIONS.—It appears to be allied to *C. delicatulus*, from which it is distinguished by the leaflets spinulous on the mid-costa only. It seems allied also to *C. Helferianus*, but this has fascicled leaflets, while they are equidistant in *C. nicobaricus*. Its characteristics amongst the species of the group are its slenderness, the leaf-sheaths armed with rather broadly laminar, sometimes very long, elastic, entirely light-coloured spines; and the numerous equidistant, linear, subulately acuminate, unicostate leaflets, with only the mid-costa bristly-spinulous on both surfaces.

PLATE 84.—Calamus nicobaricus *Becc.* Naked cane; two portions of the sheathed and leafy stem, one armed with long and the other with shorter, slender spines.—From MEN's specimens in Herb. Becc.

69. CALAMUS MYRIACANTHUS Becc. in Rec. Bot. Surv. Ind. ii, 214.

DESCRIPTION.—Not scandent (?), rather robust. *Sheathed stem* about 4 cm. in diam. *Leaf-sheaths* not flagelliferous (always?), very thick and woody, not gibbous above and gradually passing into the petiole, open anticously longitudinally, with the remains (in adult leaves), on the margins, of the decayed ocrea, entirely covered with innumerable, mostly small, short, solitary acicular horizontal spines which rest on a swollen base; other spines larger than the above, reddish-brown, 10–15 mm. long, sometimes confluent by their bases and also disposed in short horizontal series, occur on the lower part of the back, while near the mouth and along the margins the spines are more crowded, longer and horizontal and of different nature, some of them being criniform and needle-like and others laminar and 2 cm. in length. *Leaves* large, non-cirriferous, the only one seen by me 2·5 metres in length; the petiole robust, 60 cm. long and 12–13 mm. broad at the base, channelled very superficially and smooth above, convex beneath and armed only at the sides with very stout claws; rachis robust and armed closely at the margins like the petiole, and along the middle beneath with very robust at first solitary and, from the middle upwards, ternate claws; leaflets few (27 in all) usually subopposite in the first portion, with the pairs rather distant, irregularly alternate upwards and speedily decreasing in size towards the summit, large, broadly oblanceolate, somewhat concavo-convex, gradually narrowed to an acute base, broadest above the middle and thence tapering to a bristly tip, firmly papyraceous, conspicuously discolorous, dull-green and glabrous above, whitish beneath but without a detachable indumentum, with 7–8 main costae which are naked on both surfaces but much more acute and prominent beneath than above; the mid-costa not stronger than the side ones; transverse veinlets extremely numerous and approximate but not very conspicuous; margins smooth, often bordered, especially on the lower surface, with a polished band; the largest leaflets, the lower ones, 40 cm. long, 7–7·5 cm. broad; the two of the terminal pair slightly decurrent and free at the base, 18–20 cm. long, 2 cm. broad. *Male spadix* . . . . . *Female spadix* simply decompound, flagelliform, nodding, 2·60 m. long in one specimen (including the peduncular part), with few (3) partial inflorescences and with a terminal slender filiform slightly aculeolate appendix; the peduncular part, the primary and secondary spathes covered with very small appressed rusty scales, excessively long (1·5 m.), flattened, plano-convex, with acute margins feebly armed with very slender acicular scattered spines, gradually passing into the very elongate basal spathe; this also somewhat flattened-tubular, closely sheathing, acutely two-edged, prolonged at the summit into an elongate lanceolate dorsally keeled point, furnished near the mouth with a few acicular long flat very weak spines; upper primary spathes also very elongate, cylindraceous, very narrow, also prolonged at the summit into a lanceolate point and equally furnished near the mouth with the peculiar spines which cover the first spathe and furthermore more or less prickly on its surface; the naked axial portions between two partial inflorescences flat or slightly concave on the inner side, and armed with slender small straight scattered spines (not with claws) on the back; partial inflorescences very long, the lowest, and largest, 80 cm. in length with 11 alternately distichous spikelets on each side; the upper ones shorter; secondary spathes tubular-infundibuliform, minutely spinulous especially near the base, obliquely truncate and ciliate-bearded at the mouth, prolonged at one side into a long triangular subulate dorsally keeled point; spikelets horizontally attached above the mouth of their respective spathe with a distinct axillary callus, slenderly vermicular, rather brittle, elongate; the lower ones, the largest, 15 cm. long with 28–30 bifarious flowers on each side; the upper ones gradually shorter; the terminal 7–8 cm. only; spathels hairy-furfuraceous, bracteiform, very approximate, concave, very broad, prolonged into a strongly deflexed striately veined acuminate point; involucrophorum indistinct, represented by a very small scale-like appendix on the side of the neuter flower; involucre laterally attached almost outside its own spathel at the base of the one above, explanate, formed by two triangular strongly veined bracts, which are united by their bases; areola of the neuter flower depressed, very small, indistinct. *Female flowers* conic, small, 3·5–4 mm. long, the calyx flat, callous and somewhat broadened at the base, strongly striately veined, with 3 very short acute teeth; the corolla slightly longer than the calyx, not striate, and shining outside. *Neuter flowers* very acute, narrower, but as long as the female ones and with a comparatively longer corolla. *Fruit* unknown.

HABITAT.—Borneo in Sarawak: on the hills near the sea at Bintulu, *Beccari* P. B. No. 3698.

OBSERVATIONS.—The species is founded on a specimen of an entire leaf and a female spadix in flower. Its affinities are not obvious. It would appear to approach *C. bacularis*, and like this I suppose it an erect and not a climbing species on account of its non-cirriferous leaf and the form of the leaf-sheaths which are not gibbous, not tubular but widely open on the ventral side and gradually passing into the petiole. Provisionally I have placed it amongst the anomalous species of Group IV.

PLATE 85.—Calamus myriacanthus *Becc.* Leaf-sheath; an intermediate portion of a leaf (lower surface); the summit of the same leaf; basilar portion of a male spadix with an entire partial inflorescence.—From Beccari, P. B. No. 3698.

70. **CALAMUS PYGMÆUS** Becc. Malesia, iii, 62, and Rec. Bot. Surv. Ind. ii, 205.

DESCRIPTION.—Not scandent, very small and delicate. *Stem* very short, torulose, creeping and rooting, 7–8 mm. in diam., its internodes excessively short and covered by the remains of the old leaves, the summit ascending. *Leaf-sheaths* not flagelliferous, not or very shortly tubular at the base, amplectent and open on the ventral side, gradually passing into the petiole, armed with flat, small, 4–7 mm. long, deflexed tawny spines, which are very often approximate by their bases and subseriate. *Ocrea* short, liguliform, at first fringed-furfuraceous at the margins, ultimately naked and deciduous. *Leaves* not cirriferous, 45–50 cm. in length, including the rather long (16–18 cm.) petiole; this subterete but narrowly channelled above, armed, mainly near the base and beneath, along the middle, with few, straight, horizontal, 5–6 mm. long spines; rachis quite unarmed, covered when young with brown, fugacious, woolly-furfuraceous indumentum, rounded beneath, acutely bifaced above; leaflets numerous (20–30 on each side), very closely and regularly equidistant or pectinately set, mostly opposite near the base, alternate upwards, inserted at an angle of 45°, thin in texture but rigidulous, brownish and dull when dry, concolorous on both surfaces, linear-lanceolate, slightly narrowed at the base, gradually acuminate into a rather densely setose ciliate apex; the mid-costa (rather strong) and one secondary nerve on each side of it spinulous above; beneath, the mid-costa alone sparingly spinulous; all leaflets of about one size, the largest 10–12 cm. in length and 6–8 mm. wide, only few near the base and those near the summit slightly smaller; the two of the terminal pair quite free at the base. *Male spadix* filiform, very long and delicate, with very few (2) partial inflorescences of which the lowest supradecompound, the uppermost simply decompound; primary and secondary spathes and spikelets as in the female spadix hereafter described; spathels tubular as in the female spikelets; involucre cupular, laterally attached to the base of the spathel above its own, acutely bidentate on the side next the axis. *Male flowers* very small, hardly 2 mm. long; calyx strongly veined, divided down to the middle into 3 broad acute lobes; corolla with acute segments, twice as long as the calyx. *Female spadix*, relatively to the size of the plant, excessively long (1–1·8 m.), filiform, terete, very slender, 2 mm. in diam. at most, ending in a very slender smooth filiform appendix; primary spathes excessively narrow, very strictly sheathing, cylindraceous throughout, obliquely truncate at the mouth and produced at one side into a short triangular or lanceolate point; partial inflorescences very few (2–3), very distant and very delicate, lax, spreading, 10–12 cm. long, with very few (4–6 in all) spikelets; secondary spathes strictly sheathing, tubular, slightly clavate, smooth, obliquely truncate and naked at the mouth, obsoletely apiculate on one side; spikelets filiform, zig-zag sinuous, 1·5–3 cm. long, horizontally inserted above the mouth of their own spathe, conspicuously callous in their upper axilla, with very few (2–3) flowers on each side; spathels tubular, uncommonly elongate, slightly enlarged above, strongly striately veined, truncate and apiculate at one side at the mouth; involucrophorum laterally attached to the base of the spathel above its own, shallow and irregularly cupular with an axillary callus next the axis; involucre irregularly cupular, strongly veined; areola of the sterile flower rather large and more or less depressedly lunate. *Female flowers* very small (hardly 2 mm. long), relatively very remote (3–4 mm. apart). *Fruiting perianth* not pedicelliform, its calyx split almost to the base into 3 very broad apiculate lobes, these slightly shorter than the segments of the corolla. *Fruit* very small (immature 6 mm. long), broadly ovate with a conical top; scales in 12 series, shining, convex, not channelled along the middle, light-yellowish, bordered by a broad chocolate-brown band which extends to the erosely toothed tip. *Seed* not seen perfectly ripe.

HABITAT.—Borneo; On Mount Mattang, near Kuching in Sarawak *Beccari* (P. B. No. 1924).

OBSERVATIONS.—This is perhaps the smallest species of the genus; though nearly stemless and devoid of the usual organs of climbing, the very slender and long spadices raise themselves amongst the shrubs by means of the small divaricate spikelets acting as rigid hooks.

PLATE 86.—Calamus pygmæus *Becc.* The entire female plant with a detached male spadix, from No. 1924 of the P. B. in Herb. Becc.

71. CALAMUS BARBATUS Zipp. in Bijdr. Nat. Wet. v, 178; Machlot in Bull. Sc. Nat. xxiv, 67; Mart. Hist. Nat. Palm. iii (1st edit.) 213; Kunth Enum. Pl. iii, 213; Miq. De Palmis, 29; H. Wendl. in Kerch. Les Palm. 235;

Dæmonorops barbatus Bl. Rumphia iii, 42 (excl. *Rottang acidum* Rumph.) t. 145; Mart. l. c., 330; Miq. Fl. Ind. Bat. iii, 100; Walp. Ann. iii, 480, and v, 829; Becc. Malesia, i, 87, 96.

DESCRIPTION.—Scandent, sheathed stem as thick as a finger. *Leaf-sheaths* flagelliferous, not gibbous above (always?), gradually passing into the petiole, covered with a grey ochraceous scurf when young, open upwards on the ventral side, where densely covered near the margins with long erect rigid bristles of a reddish-brown colour, these intermingled with some slender subulate spines; the remainder (the greatest part) of the surface armed with subulate, straight, scattered, horizontal or slightly deflexed spines which arise from a swollen base. *Leaf-sheath flagella* filiform, clawed upwards, strictly sheathed in their basal portion with a flattened spathe which is spinous at the margins and densely bristly at the mouth. *Ocrea* rather short, liguliform, densely bristly-hispid, decurrent on the borders of the leaf-sheaths and at the base of the petiole. *Leaves* about 1 m. in length, not cirriferous; petiole short (4–7 cm. long), naked or sparsely aculeolate at the sides, convex, polished and unarmed beneath, slightly concave or faintly and broadly channelled above near the base, flattish upwards, rachis channelled above in its first portion, bifaced upwards, rounded beneath, where armed near the base at the sides and throughout along the middle with small solitary or geminate claws; leaflets numerous, inequidistant or approximate into a few groups of many, where they are equidistant and about 15 mm. apart one from the other, the various groups being separated by vacant spaces of 4–5 cm. in length, narrowly lanceolate, almost equally attenuated to both ends, gradually acuminate into a bristly-penicillate tip, thinly chartaceous, rigidulous, almost concolorous on both surfaces, 10–18 cm. long, 1 cm. broad, sub-3-costate above, with the mid-costa acute and one weaker nerve on each side of it, all three furnished with few, relatively strong, almost black setae; beneath all nerves faint and naked; transverse veinlets fine, not very crowded; margins with few and long cilia. *Male spadix* . . . . . *Female spadix* rigid, short, simply decompound; primary spathes tubular, slightly enlarged above, chartaceous, aculeolate on the back, more or less lengthened out at the summit into a lanceolate limb, bristly-bearded at the margins; partial inflorescences stiff, erect, the largest seen by me about 20 cm. long, furnished with 3–4 spikelets on each side and terminated by a rigid tail-like appendix; secondary spathes elongate-infundibuliform, unarmed, finely striately veined, entire, obliquely truncate and naked at the mouth, prolonged at one side into a triangular erect acute point; spikelets inserted just at the mouth of their own spathe and arising erect from it, then spreading flexuose, rigid, cylindraceous, rather thick, terminated by a short, tail-like, rigid, 1 cm. long appendix; spathels infundibuliform, finely furfuraceous, striately veined, truncate and naked at the mouth, where produced at one side into a short, acute, patent point; involucrophorum cupular, hollowed out into the base of the spathel which is above its own and with a very short limb; involucre deeply cupular, truncate, emarginate on the side next to the axis; areola of the sterile flower distinct, depressedly lunate. *Female flowers* relatively large (5 mm.). *Fruiting perianth* not pedicelliform, but with the calyx narrowed and callous at the base and enclosed in the involucre, divided down beyond the middle into 3 ovate, acute lobes; corolla with the segments narrow and not longer than the calyx. *Fruit* (mature) obovate, about 18 mm. long and 11–12 mm. in diam., conically beaked; scales in 18 series, dark-yellowish, convex, slightly channelled along the middle with a rather broad, very dark intramarginal line and lighter, erosely toothed tip and margins. *Seed* irregularly subsphaeric, 9 mm. long, 6 mm. thick, with a deep circular chalazal fovea on the raphal side, convex and uneven on the back; albumen equable; embryo basal.

HABITAT.—The native country of this species is said by Blume and Miquel to be New Guinea, where it was probably gathered by Zippel on the southern coast of that Island; but Blume on a label to some fruits of this species in the Leyden Herbarium has written: "Timor; Zippel;" Miquel (Fl. Ind. Bat. iii, 101) gives also the localities of Makassar and Bouton in Celebes for *C. barbatus*, but I can hardly believe such a thing possible, as I do not know any species of *Calamus* inhabiting two such remote regions.

Observations.—A very distinct species not closely related to any other known to me. My description is based upon one of the type-specimens of Blume preserved at Leyden. Amongst the Papuan species it is distinguished by the spinous leaf-sheaths gradually passing into the petiole and densely covered near the mouth with brown erect rigid bristles; by the leaves with a short petiole and numerous inequidistant narrowly lanceolate subtricostulate leaflets, their 3 nerves bristly above, naked beneath; by the rigid short spadix with spathes which are densely bristly bearded at their mouth.

Plate 87.—Calamus barbatus *Zipp.* The summit of a plant and portion of a partial inflorescence with immature fruit; from an authentic specimen preserved in the Herbarium at Leyden.

72. Calamus vestitus Becc. Malesia iii, 59 and 62.

Description.—Scandent, slender. *Sheathed stem* 12–15 mm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous or pouched above, with an obtuse slightly raised costa which runs downwards lengthwise from the base of the flagellum, and rather densely armed with small, short (5 mm. long at most), flat, delicate or almost bristly, deflexed, scattered, and occasionally bi-trifid spines. *Leaf-sheath flagella* slender, filiform, densely armed with small, slender, solitary, geminate or ternate claws. *Ocrea* uncommonly large, completely enfolding or sheathing the younger part of the stem, 15–18 cm. long, very thinly membranous, and exsuccous, later lacerated and finely fibrous and ultimately destroyed. *Leaves* short (about 60 cm. long), not cirriferous, with the petiole almost obsolete; rachis flat in its first portion and bifaced upwards above, rounded and unarmed beneath near the base and armed upwards along the middle with solitary rather slender claws; leaflets very numerous, equidistant, closely inserted at a rather acute angle, thinly papyraceous but rigidulous, dull on both surfaces, slightly paler beneath, linear-ensiform, subulately acuminate at the summit, somewhat narrowed to the base, 3-costulate, or with an acute mid-costa and one distinct secondary nerve on each side of it, the 3 nerves furnished above with many dark and rather long bristles; beneath, all nerves faint and with a few bristles confined to the central one; margins very minutely and appressedly spinulous except at the point, where the spinules are longer and spreading; the largest leaflets, those of the lower third-part of the rachis, 20 cm. long and 10–12 mm. broad; the uppermost suddenly a good deal shorter and less acuminate, the two of the terminal pair small and free at the base; transverse veinlets not very regular, much interrupted and very sharp. *Male* and *female spadices* very much the same, elongate-flagelliform; primary spathes very loug-tubular and strictly sheathing, decayed and afterwards lacerated and fibrous at the mouth, fugaciously rusty-furfuraceous, rather densely armed with many very small solitary short black-tipped claws which have a broad and light-coloured base; lowest primary spathe somewhat compressed, not very acute at the edges, flattish and unarmed on the inner side, densely armed with the usual small slender claws on the back; the upper primary spathes cylindraceous, densely clawed on the back, narrowed at the base, where in the attenuated axial portion flat or almost channelled on the inner side, convex and clawed on the back; secondary spathes 3–4 cm. long, very narrowly tubular, slightly enlarged and somewhat loosely sheathing above, where very minutely and sparsely aculeolate, suddenly narrowed and flattened towards the base, obliquely truncate and when young furfuraceous-ciliolate at the mouth and prolonged at one side into a short triangular acute point. *Male spadix* ultra-decompound with not many, lax, rather remote partial inflorescences, these inserted inside the mouth of their own spathe, 5 in one incomplete specimen, 15–25 cm. apart and terminating in an inconspicuous filiform tail-like appendix; the largest inflorescences, the lowest, in the specimen mentioned above 50 cm. in length and with 14 secondary spathes, of which the lower ones bear branched or compound spikes and the others simple spikelets; spikelets inserted just above the mouth of their own spathe with an indistinct axillary callus; 5–6 cm. long with 14–16 flowers on each side; spathels broadly infundibuliform, horizontally truncate at the mouth, strongly and sharply striately veined, prolonged at one side into a very short tip; involucre subdimidiately cupular, laterally attached to the base of the spathel above its own, truncate and slightly bidentate on the side next to the axis. *Male flowers* small, about 3 mm. long, bifarious, slightly outwardly curved, the calyx strongly striately veined, acutely 3-toothed; the corolla one-third longer than the calyx with narrow acute and externally polished segments. *Female spadix* simply decompound; partial inflorescences elongate with 6–7 (and sometimes perhaps more) vermicular spikelets on each side, and terminated by a short (4 cm. long), filiform, aculeolate, tail-like appendix; spikelets inserted just above the mouth of their own spathe, not callous at the axilla, flexuose or slightly arched, horizontal or deflexed, 6–9 cm. long, with 5–10 rather remote flowers on each side; spathels as in the male spikelets but a little larger and longer; involucrophorum dimidiately cupular, laterally attached to the base of the spathel above its own; involucre cupular, flat, two-keeled and bidentate on the side next to the axis; areola of the neuter flower depressedly lunate. *Female flowers* about 4 mm. long, often slightly outwardly curved, subcylindraceous with a conical summit; the calyx strongly striately veined, shortly 3-toothed; the corolla as long as the calyx. *Fruit* unknown.

HABITAT.—Northern New-Guinea at Andai, *Beccari* P. P. No. 771.

OBSERVATIONS.—A very well-marked species distinguished by its very large thin exsuccous and ultimately lacerated and fibrous ocreas (which entirely cover the younger part of the stem); by the almost epetiolate leaves with numerous equidistant narrow leaflets; and by the elongate flagelliform spadices which are longer than the leaves.

To this same species probably may be referred one specimen gathered by Sig. L. M. D'Albertis on the Fly River, consisting of the summit of a leaf and of some detached fruits.

PLATE 88.—Calamus vestitus *Becc.* Portion of the stem with an entire leaf; portion of a male spadix (in the middle of the plate); the upper part of a female spadix in flower (on the left side of the plate).—From P. P. No. 771 in Herb. Becc.

73. **Calamus ralumensis** Warb. in K. Sch. Fl. Neu-Pomm., 98; Schum. & Laut. Fl. Deutsch. Schutzg. in der Südsee, 202; Becc. in Rec. Bot. Surv. Ind. ii, 217.

C. longipinna Laut. & K. Sch. l. c. 203; Becc. l. c.

Description.—High scandent, of moderate size. *Sheathed stem* 2·5—3 cm. in diam., naked canes with a polished surface, their internodes about 30 cm. long, cylindraceous, slightly clavate or larger in their upper part near the node, where about 2 cm. in diam. *Leaf-sheaths* sometimes flagelliferous, green even when dry, strongly gibbous above, marked longitudinally from the insertion of the flagella or spadices lower down by an obtusely raised costa, altogether smooth or more or less armed with a few very small, scattered, short, broad-based prickles. *Ocrea* very large, lanceolate-auriculiform or like the ears of the ass, 15–30 cm. long, rigid, chartaceous, exsuccous, not disintegrating into fibres, at first furfuraceous, later glabrous, unarmed or very sparingly spinulous. *Leaf-sheath flagella* filiform, very slender, with the lowest spathe almost smooth, densely armed on the outer side of the intermediate spathes with 2–3-nate claws, these more numerous and slender in the terminal very slender filiform portion. *Leaves* not cirriferous, above 1 m. in length, those of the upper part of the stem almost epetiolate; the first portion of the rachis flat above, where, as at the sides, unarmed, roundish beneath, where sometimes smooth in the first portion, but armed upwards along the middle up to the base of the terminal leaflets with solitary, rather closely and regularly set dark-tipped claws; in the upper face (the rachis) is narrowly channelled at the sides where are inserted the leaflets, and acutely bifaced and smooth upwards; leaflets numerous, equidistant (at least in the upper leaves of the full grown plants), the lower ones horizontal, the others inserted at an angle of about 45°, thinly chartaceous but rigidulous, dull on both surfaces, slightly paler beneath, ensiform or very narrowly lanceolate-ensiform, gradually acuminate from the middle upwards into a bristly-spinulous tip, somewhat narrowed and plicate at the base, where furnished above with a distinct axillary callus at their insertion and of a similar one, beneath, inside the plica: they are 3-costulate with the mid-costa (acute) and one more slender costa on each side of it, all furnished with rather remote fulvous bristles: beneath all the nerves less prominent and only the mid-costa sparingly bristly-spinulous; margins acute (not thickened by a marginal nerve) furnished with small spinules, these longer and more patent towards the summit; the largest leaflets, those a little above the base, 30-40 cm. long and 20–25 mm. broad, the upper ones rather suddenly shorter, and the two of the terminal pair small and free at the base; transverse veinlets not very regular and much interrupted. *Male spadix* ultradecompound, large and elongate; with many rather dense partial inflorescences, flagelliform at the summit and terminating in a tail-like filiform (6–10 cm. long) densely aculeolate appendix; primary spathes tubular, closely sheathing, elongate, marcescent and dissolved into filaments at the mouth, light (when dry), finely longitudinally striate, unarmed on the ventral or inner side, sprinkled with very small solitary broad-based claws on the back; partial inflorescences arising erect from the mouth of the spathe and then arched and pendulous, much branched; one is 50 cm. long and forms a rather large and dense panicle; others (of the upper part of the spadix) are much smaller and 12–25 cm. apart; secondary spathes elongate-infundibuliform, membranous, loosely sheathing, unarmed, or sprinkled with very small tuberculiform prickles, exsuccous in their upper part, obliquely truncate at the mouth and prolonged at one side into a broad triangular acute point; tertiary spathes like the secondary ones but usually not decayed near the mouth; spikelets flexuous, brittle (when dry), slender, the largest 5–6 cm. long, with 20–22 flowers on each side; spathels broadly asymmetrically infundibuliform, truncate at the mouth, acute at one side, very finely striately veined; involucre dimidiately cupular or like a swallow's nest, obliquely truncate, acutely bidentate, two-keeled and with the margin deeply excavate on the side next to the axis. *Male flowers* ovate (when young), their calyx finely and sharply striately veined. *Female spadix* very elongate, flagelliform, terminating in a rather long filiform flagellum; this rather densely armed with scattered or more or less aggregate claws; primary spathes tubular, elongate, closely sheathing, greenish (when dry), longitudinally striately veined, lacerate-fibrous at the mouth; the lowest slightly flattened, unarmed: the intermediate ones cylindraceous, more or less aculeolate on the back of their upper part: the upper ones more densely aculeolate, often split on the ventral side; partial inflorescences few and rather remote, arising erect from inside their spathe and terminating in a very small (about 1 cm. long) caudiculum; the lowest, the largest, 30–40 cm. long, with 8–9 spikelets on each side; secondary spathes tubular-infundibuliform, closely sheathing, entire and truncate at the mouth, prolonged at one side into a broad triangular point, more or less armed on the back with very small scattered subtuberculiform prickles; spikelets elongate, vermicular, inserted above the mouth of their own spathe with a distinct axillary callus and a transversal rima, very patent, horizontal or arched-subdeflexed: the largest, the lowest, up to 15 cm. long, with about 20 flowers on each side; those near the summit one-half or two-thirds shorter; spathels subcylindraceous-infundibuliform, truncate horizontally at the mouth, apiculate at one side, finely striately veined; involucrophorum attached to the base of the spathel above its own, irregularly cupular, more or less acutely bidentate on the side next to the axis; involucre more regularly cupular than the involucrophorum and enclosed in this, with unequal margin; areola of the neuter flower distinctly lunate. *Female flowers* conic, 3–3·5 mm. long; the calyx callous at the base, strongly veined, with 3 short acute connivent teeth; the corolla as long as the calyx, with ovate-lanceolate concave acute segments. *Fruiting perianth* very shortly pedicelliform. *Fruit* sphaeric (when ripe), about 1 cm. in diam. (ovoid when immature), minutely apiculate; scales in 15 series, strongly convex and faintly channelled along the middle, of one colour, light-yellow with very narrow scarious margin and rather obtuse tip. *Seed* globular, 5–6 mm. in diam., coarsely tubercled and irregularly grooved; chalazal fovea in the centre of the raphal side, shallow and indistinct; albumen equable; embryo basal.

HABITAT.—German New-Guinea, where it seems common. I have seen specimens from Kaiser Wilhelmsland, Gogol River, *Lauterbach* No. 905, ♀ plant, and No. 866, ♂ plant in Herb. Berol.; Bismarck-Ebene, in the forest at 150 m. above the sea, *Lauterbach* No. 2814 in Herb. Berol.; Ramu River, *Tappenbeck* No. 65 in Herb. Berol.; Bismarck Archipelago, *Lauterbach* No. 242, *Warburg*, *Dahl*, in Herb. Berol.

OBSERVATIONS.—*C. ralumensis* is closely related to *C. vestitus* Becc., from which it differs in the different armature of the leaf-sheaths and in the ocrea, which is chartaceous and not reduced to filaments, and in the larger leaflets. It is also allied to *C. macrochlamys*, but this has lanceolate and distinctly grouped leaflets.

It is a somewhat variable plant. Number 242 of Lauterbach has the upper and very young part of the sheathed stem 14 cm. in diam., furfuraceous and armed with a few small spines; its flagella have the first spathe almost unarmed; the ocrea is 13 cm. long and is furnished with some very slender spiculae, which perhaps disappear with age. Another specimen of a leaf from a sterile and probably young plant, collected by Dahl at Ralum (Herb. Berol.) which I consider also as belonging to *C. ralumensis*, has a portion of a sheath armed more than usual with short scattered horizontal spines and the leaves with a petiole which is 45 cm. long, roundish, slightly channelled above, and rather strongly armed with short spines, and the leaflets subequidistant; another specimen of the same gathering has also some short spines on the sheaths, and the leaf with a petiole 15 cm. long, flattish above and round beneath, where armed only along the middle with light-coloured claws; the leaflets are more or less distinctly grouped, with vacant spaces 6–7 cm. in length, but otherwise not differing from those described above. *C. longipinna* seems to me nothing more than the male plant of *C. ralumensis.*

PLATE 89.—Calamus ralumensis *Warb.* An entire partial male inflorescence with very young flowers from the lower portion of the spadix; the summit of a leaf from underneath; an intermediate portion of the same leaf from above.—From the type-specimen of *C. longipinna*, Laut. and K. Sch. in Herb. Berol.

PLATE 90.—Calamus ralumensis *Warb.* Terminal portion of a plant with an entire ocrea and the base of a leaf, intermediate portion of a female spadix in flower, from Lauterbach No. 242, Ralum in New Pommerania in Herb. Berol.; intermediate portion of a leaf from underneath and terminal portion of a female spadix with young flowers, from a specimen of Warburg in Herb. Berol.

74. CALAMUS MACROCHLAMYS Becc.

C. Hollrungii (not of Becc.) K. Schum. & Laut. Fl. Deutschen Schutzg. in der Südsee, p. 203.

DESCRIPTION.—Apparently scandent and of moderate size. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* (in the small portion seen by me) unarmed, strongly gibbous above. *Ocrea* extraordinarily large, auriculiform, recalling the ears of the ass, up to 35 cm. long, enfolding the younger part of the stem, covered with fuscous-furfuraceous scurf, chartaceous, exsuccous, rigid, later split longitudinally on the outer side, not dissolving into fibres, furnished mainly near its margins with very small confluent spinules (which are disposed in oblique lines) or with small raised approximate very finely spinuliferous crests. *Leaf-sheath flagella* almost unarmed and somewhat flattened in their lower portion. *Leaves* rather short (about 90 cm. long), not cirriferous; petiole rather short (11–12 cm. long), almost biconvex, unarmed and with rather obtuse margins; rachis smooth and acutely bifaced above from its base, very densely armed beneath with numerous solitary not large dark-tipped claws; leaflets not numerous, very conspicuously approximate into 4 opposite bundles of from two to four pairs each, with vacant spaces 12–20 cm. in length between each bundle; the leaflets are lanceolate, oblanceolate or lanceolate-elliptic and almost equally tapering to both ends, plicate or doubled backward and acute at the base, where more or less callous above at their insertion and also furnished beneath with another sometimes distinct callus inside the basal plica, rather shortly and suddenly acuminate in a slightly bristly-spinulous tip, papyraceous, rather firm, glabrous and dull on both surfaces, paler beneath, with an acute mid-costa and a few slender side-nerves, quite naked on both surfaces; margins acute, smooth, except towards the apex, where very finely spinulous, often bordered in the upper surface with a polished band; transverse veinlets crowded, fine and much continuous; the side-leaflets 25–30 cm. long and 4–5 cm. in width; those of the lowest group narrower (2·5–3 cm.) and those of the terminal group shorter (17–20 cm.) but not narrower; the two of the terminal pair confluent and forming a forked flabellum. *Male spadix* somewhat shorter than the leaves, forming a rather dense cupressiform panicle, in one specimen with 7 approximate partial inflorescences, terminating in a short tail-like appendix which is sheathed with aculeolate spathes; primary spathes tubular, the lowest elongate (20 cm. long), very closely sheathing, somewhat flattened, biconvex in section, with the edges acute and quite smooth, obliquely truncate at the mouth and prolonged at one side into a triangular acuminate point; upper primary spathes much shorter, thinly coriaceous, cylindraceous, slightly enlarged above, truncate and entire at the mouth, where prolonged at one side into a triangular acute point, armed with a few very small recurved aculei; partial inflorescences inserted inside the mouth of their own spathe, arising erect from these and then spreading and arched, furnished with many secondary inflorescences which gradually decrease in length and number of spikelets from the base towards the summit; the largest secondary inflorescences have various (6–7) spikelets on each side and these also decrease in size and number of flowers from the base upwards; the lowest partial inflorescence 20 cm. in length, the upper ones gradually shorter; secondary and tertiary spathes infundibuliform, unarmed, finely striolate longitudinally, truncate at the mouth and prolonged at one side into a triangular subulately acuminate point; spikelets slender, inserted at the mouth of their own spathe with a distinct axillary callus, spreading or horizontal, slightly arched, comb-like when charged with flowers; the largest, the lowest, 2–3 cm. long with 13–15 flowers on each side, the upper ones gradually shorter; spathels very rowded, bracteiform, concave and almost boatshaped, strongly striately veined, acute or obtuse; involucre cupular, truncate, entire, not distinctly two-keeled or bidentate on the side next to the axis. *Male flowers* very approximate or one in contact with the other, perfectly bifarious in one plane, almost horizontally inserted, oblong, slightly apiculate at the summit, 3·5 mm. long; the calyx thick in texture, black when dry, indistinctly and coarsely veined, with 3 light-bordered broad acute teeth; the corolla twice as long as the calyx, polished outside. Other parts unknown.

HABITAT.—German New Guinea at Sattelberg in Kaiser Wilhelmsland, *Bamler* No. 39 in Herb. Berol.

OBSERVATIONS.—A very handsome species approaching *C. vestitus* in its extraordinarily large ocreas which are even larger than in this; furthermore very remarkable by its leaves with not numerous, distinctly grouped, and lanceolate unicostate leaflets; and by the compact short paniculate male spadix.

Plate 91.—Calamus macrochlamys *Becc.* The summit of a plant with the base of a fully developed leaf and an entire male spadix.

Plate 92.—Calamus macrochlamys *Becc.*—The entire remaining portion of the leaf, of which the base is figured in the preceding plate.—From the type-specimen in the Berlin Herbarium.

75. Calamus gogolensis Becc. sp. n.

Description.—Scandent, of moderate size. *Sheathed stem* about 2 cm. in diam. 2–4 cm. Lauterbach. *Leaf-sheaths* flagelliferous, light-greenish when dry, gibbous above, marked from the insertion of the flagella lower down with an obtusely raised costa, rather densely armed with light-coloured spines of which some are very small and subtuberculiform and others laminar, slender, deflexed, of variable size, short or up to 15–20 mm. long, these last usually present near the mouth. *Leaf-sheath flagella* filiform, almost unarmed in their lower portion, higher up very densely covered with very small usually scattered claws. *Ocrea* rather large, 8–10 cm. in length, liguliform, obtuse, membranous, exsuccous and very finely spinulous on the axillary side (between the petiole and the stem), and disintegrated into reticulate fibres or filaments on the outer side. *Leaves* not cirriferous, about 1 m. in length; petiole rather short (12 cm. in one leaf), rounded beneath, where armed near the margins and along the middle with many small scattered prickles; rachis flattish above in the lower third-part and bifaced upwards, convex beneath where armed along the middle and at the sides, from the base to the summit, even between the two terminal leaflets, with uniform, short, solitary, light-coloured or slightly brown-tipped claws; leaflets not very numerous, in one leaf conspicuously approximate into 6 opposite bundles of two to three pairs each with vacant spaces of 10–15 cm. between each bundle; the leaflets are thinly papyraceous, rigidulous, dull and concolorous on both faces, ensiform or very narrowly lanceolate-ensiform, somewhat narrowed to the base where attached to the rachis with a small axillary callus, gradually acuminate from the middle upwards into a tip, which is bristly spinulous at the sides, tricostulate with the mid-costa acute and the side costae more slender, all three furnished above with a few short fulvous bristles; beneath all the nerves less prominent and only the mid-costa with a few bristly spinules towards the apex; margins not thickened, appressedly spinulous; transverse veinlets very slender, much interrupted; the largest leaflets up to 35 cm. in length and 2–2·5 cm. in width, but except those of the terminal group which are shorter they are all of about the same dimensions; the two of the terminal pair confluent up to the middle and forming a small forked flabellum.—Other parts unknown.

Habitat.—German New Guinea: in the upper part of the course of the Gogol River, *Lauterbach* No. 1560, 24th Nov. 1890, in the Berlin Herbarium.

Observations.—I have seen of this only one sterile specimen with a portion of the stem and an entire leaf. It has the same kind of armature on the leaf-sheaths as *C. vestitus* and it is evidently closely related to *C. ralumensis* from which it differs in the densely spinous leaf-sheaths, shorter and obtuse ocrea, and in the leaflets very distinctly approximate in bundles.

PLATE 93.—Calamus gogolensis *Becc.* Portion of the sheathed stem with the base of a leaf and the lower portion of a flagellum; the summit of the leaf, of which the base is attached to the sheath in the figure mentioned above.—From Lauterbach's type-specimen in Herb. Berol.

76. **CALAMUS TENUIS** Roxb. Fl. Ind. iii, 780 (printed *tenuius*); Kunth Enum. Plant. iii, 211; Mart. Hist. Nat. Palm. iii, 212 (1st edit.) and 335; Griff. in Calc. Journ. Nat. Hist. v, 46 and Palms Brit. Ind. 57, pl. CXCIII A.B.C.; Walp. Ann. iii, 485, and v, 830; Miq. Fl. Ind. Bat. iii, 118; Kurz in Journ. Asiat. Soc. Beng. xliii (1874) 212, pl. XXXIB, and For. Fl. Brit. Burma 520; Hook. f. Fl. Brit. Ind. vi, 447: Becc. in Rec. Bot. Surv. Ind. ii, 206.

C. Royleanus Griff. in Calc. Journ. Nat. Hist. v, 40, and Palms Brit. Ind. 53, pl. CXCI; Mart. Hist. Nat. Palm. iii, 335; Walp. Ann. iii, 485 and v, 830.

C. Heliotropium Ham. Cat. Dried Plants, 90, No. 877 (name only, as from Griff.); Mart. Hist. Nat. Palm. iii (1st edit.) 211 and 334; Kunth Enum. Pl. iii, 210; Griff. in Calc. Journ. Nat. Hist. v, 44, 51 and Palms Brit. Ind. 61; Walp. Ann. iii, 484, and v, 830; H. Wendl. in Kerch Les Palmiers, 236 [excl. *Phoenicoscorpiurus* Pluk.?, this reduced to *C. Rotang* (L) Willd].

C. amarus Lour. Fl. Cochinchin., 1st edit., 1790, i, 210?

DESCRIPTION.—High scandent, rather slender or of moderate size. *Sheathed stem* 1–2 cm. in diam.; naked canes 5–15 mm. in diam. with a light-yellowish vitreous surface; the internodes 15–25 cm. long. *Leaf-sheaths* gibbous above, more or less armed with horizontal, scattered, straight, usually short spines which have a narrow, 8–10 mm. long, brown tip and a broad light base, this hollow or concave underneath; sometimes two or more spines, disposed in oblique series, are in contact by their extendep bases, or the spines being quite rudimentary, their bases form many interrupted oblique slightly raised ridges. *Leaf-sheath flagella* very slender, compressed and unarmed or nearly so in their basal portion, terete and armed upwards with scattered solitary or more or less confluent claws. *Ocrea* short, 5–10 mm. long at most, truncate, brown, exsuccous, brittle, glabrous. *Leaves* not cirriferous, relatively short (0·6–1 m. long), fugaciously and finely furfuraceous; petiole 10–15 cm. long or shorter, broadly channelled or flattish above, rounded and almost unarmed or sparingly furnished along the middle with short, almost straight spines below, its margins very acute, more or less irregularly and remotely armed with small, straight or hooked. spines; rachis bifaced and smooth above in its upper portion, sub-regularly armed beneath along the middle with solitary black-tipped claws, which sometimes have a rather long and almost straight point; leaflets very numerous, 20–35 on each side, papyraceous, equidistant and rather approximate, alternate or sub-opposite, linear-ensiform or very narrowly lanceolate, somewhat attenuate at the base, where suddenly plicate, very acuminate at the apex, sub-shining on the upper surface, very slightly paler beneath; tricostate, or with the mid-costa accompanied on each side by a secondary nerve stronger than the others; the three nerves furnished above with remote rather long spadiceous bristles; the other secondary nerves smooth, one of these generally running in close proximity to or along the margins; on the lower surface the mid-costa very slightly prominent and sparingly spinulous; margins rather closely and not very appressedly spinulous; transverse veinlets not very crowded, rather sharp and short; in some leaflets the mid-costa frequently furnished near the base on its upper surface with a small rigid spinule; the largest leaflets, the lower ones, 20–35 cm. in length, in smaller specimens 15–18 cm. only, and 15 mm. broad, the upper ones gradually decreasing in size; the two of the terminal pair quite free at the base. *Male spadix* very long (1·5 m. and sometimes more), ultradecompound, with rather many partial inflorescences; these 15–20 cm. apart; lowest primary spathe tubular, elongate, somewhat flattened, acutely two-edged, aculeolate, truncate at the mouth; upper primary spathes tubular-elongate, cylindraceous, somewhat enlarged and rather loosely sheathing in their upper part, where more or less prickly, much attenuated at the base, where flat on the inner side, convex and sparingly clawed on the back, prolonged at the summit into an acute and ultimately decayed point, keeled on the back; partial inflorescences with a slender filiform axis, the largest, the lower ones, 15–20 cm. long, rather dense, panicled, subpyramidate, with some simple spikelets in their upper part and a few branchlets lower down, the branchlets spreading and arched; the largest of these, the lower ones, 8–10 cm. long with 8–10 spikelets on each side and a terminal spikelet longer than the side ones; the upper branchlets gradually smaller; secondary spathes narrowly tubular-infundibuliform, more or less obliquely truncate at the mouth and prolonged at one side into a triangular acute distinctly striately veined point, fugaciously scaly-furfuraceous; tertiary spathes or spathes of the branchlets gradually becoming smaller towards the extremity of these, tubular with a suddenly enlarged small limb; spikelets attached a few millimeters above the mouth of their respective spathe with a distinct axillary callus, the largest, the lower ones, 2–3 cm. long with 6–10 distichous flowers on each side, rapidly decreasing in length and number of flowers from the base of the inflorescence upwards, those of the summit very short and with very few flowers; the axis of the spikelets very slender, filiform, sinuous; spathels very narrowly tubular and angular at the base, suddenly widened into a small broadly infundibuliform or sometimes bracteiform, strongly striately veined acute limb; involucre usually almost exsert from its own spathe, and obliquely attached to the base of the spathel above its own, concave, rather shallow, bidentate on the side next to the axis. *Male flowers* distichous, appressed to every flexure of the axis (like the male flowers of a *Pinanga*) completely exsert from the involucres, inserted at an angle of 45°, 4 mm. long, 1 mm. thick, oblong, very obsoletely trigonous, acute or apiculate; calyx subcampanulate, striately veined, divided down not quite to the middle into 3 broad acute lobes; corolla nearly twice as long as the calyx, tubular at the base, divided down to about the middle into three ovate-lanceolate acute segments; stamens with subulate filaments; these inflected at the apex in the bud, adnate by their bases to the tubular portion of the corolla; anthers versatile, lanceolate-sagittate, acute at the apex, rounded at the base; rudimentary ovary very small, not reaching to the middle of the undivided portion of the corolla. *Female spadix* like the male, but simply decompound; partial inflorescences ascendent from inside the mouth of their own spathe, then arched and spreading, the largest 15–20 cm. long, bearing on each side 7–10 distichous spikelets; primary spathes as in the male spadix; secondary spathes tubular-infundibuliform, 6–10 mm. long, closely sheathing, unarmed, obliquely truncate and entire at the mouth, apiculate at one side; spikelets arched, spreading or deflexed, inserted above the mouth of their own spathe with a distinct axillary callus, 2–4 cm. long spathels shortly tubular-infundibuliform, truncate at the mouth; involucrophorum subdiscoid, almost exsert from its own spathel and sometimes subpedicellate, laterally attached to the base of the spathel above its own, distinctly callous at its axilla next to the axis; involucre subdiscoid or almost flat; areola of the neuter flower depressedly lunate. *Flowers* of the young spikelets very distinctly 4-seriate, each female flower being accompanied by a well-developed neuter flower. *Female flowers* ovate, small, 3 mm. long; calyx shortly 3-toothed; corolla as long as the calyx, divided down almost to the base into 3 lanceolate acute segments; stamens with filaments forming a cup by their connate bases and subulate in the free portion; anthers sagittate. *Neuter flowers* thinner, but almost as long as the female ones *Fruiting perianth* distinctly pedicelliform, the calyx callous at the base, cylindraceous, about 1·5 mm. thick. *Fruit* globose or slightly longer than broad, 10–11 mm. in diam. shortly but distinctly and acutely beaked, 12 mm. long, including the beak but not the pedicelliform perianth; scales in 15 series, narrowly channelled along the middle, pale-yellowish, shining, with short, rather obtuse, usually dark tip; margins scarious, pale or brownish, finely erosely toothed. *Seed* ovoid, rounded at both ends, about 8 mm. in length and 5–6 mm. thick, irregularly grooved and coarsely pitted on the back, with a rather deep round chalazal fovea in the centre of the raphal side; albumen equable; embryo basal.

HABITAT.—In North India from Kumaon eastwards to Burma and Cochinchina: N. W. India, *Royle* in Herb. Petrop.; the Bhábars in Kumaon, *Strachey & Winterbottom* in Herb. Kew; at Goyalpara in the Prov. of Rungpura, *Hamilton;* frequent in Oriental Bengal and Assam; West Duars at Muraghat, *Gamble;* Silhet, *Roxburgh;* Chittagong, *Hooker f. & Thomson.* In Burma at Rangoon, *McClelland* in H. Kew; at Scinego on the High Irawaddy, *Fea* in Herb. Becc.; in Lower Cochinchina, on the mountains Dinh (Mu-xoai), near Baria, *Pierre.*

The Rotang of this species is very much used for domestic work. It is called Jatee Bhet" in Assam and "May dan" in Cochinchina.

OBSERVATIONS.—Distinguished from the allied species by its numerous equidistant linear-ensiform three-costate leaflets, the 3 costae bristly above, and beneath only the mid-costa sparingly spinulous. Peculiar characters of *C. tenuis* are also the male spikelets which, when fully charged with flowers, are like those of a *Digitaria;* the male flowers quite exsert from the involucres and with a corolla with an unusually long tube; the female flowers completely exsert from the involucres and accompanied by a very well developed neuter flower, so that the female spikelets when young have 4 distinct series of flowers.

In some specimens of *C. tenuis* originally coming from Chittagong and cultivated at Buitenzorg, the spines of the leaf-sheaths have their base so extended at the sides and the point on the spine so little evolute that one spine being in contact with the next they form continuous transverse and superficial crests or ridges; the leaflets in these specimens, which seem to form the transition between *C. tenuis* and *C. horrens*, are furnished at the base of the mid-costa with the characteristic small spinule.

I entertain no doubt about the identification of *C. Royleanus* Griff., with *C. tenuis* Roxb., having seen authentic specimens of both.

I have reduced also *C. Heliotropium* to *C. tenuis*, chiefly in consideration of its native country, though Griffith had compared it with *C. leptospadix.* I have not seen Hamilton's Catalogue of dried plants; Martius himself seems to quote this work on the faith of Griffith; but Martius adds that he has seen specimens of *C. Heliotropium* sent to him by Wallich. According to Griffith, Hamilton refers to his *C. Heliotropium* the *Phoenicoscorpiurus* of Plukenet's Phytographia, pl. 106, f. 2, but I agree with Martius (l. c. p. 334) that this figure is more like *C. Rotang* (L.) Roxb. than any other.

Hamilton's Catalogue, where Griffith (Palms p. x) says that 4 species of *Calamus* are enumerated, is a manuscript work, and is not mentioned in Pritzel's Thesaurus. In any case the first description known of *C. Heliotropium* is that published by Martius in vol. iii, p. 334 of his great work, and consequently if this does not differ from *C. tenuis,* this last name has the right of priority. The description of *C. Heliotropium* by Martius exactly agrees with the specimens of *C. tenuis* having young male flowers when the corolla is hardly longer than the calyx, whereas the fully developed male flowers have the corolla twice as long as the calyx. After all I do not know any Indian species of *Calamus*, with fully developed male flowers, where the corolla is as long as the calyx. Plate CXCI of the *Palms of British India*, with the name of *C. Royleanus*, represents a portion of the spadix of *C. tenuis* with exaggerated pedicellate immature fruit. I also regard *C. tenuis* as identical with *Calamus amarus* of Loureiro, judging from some sterile specimens collected by Pierre in Cochin-china and labelled with the same indigenous name as is assigned by Loureiro to his *C. amarus.* Nevertheless I do not think it proper to adopt the name of Loureiro, though more ancient, not having better documents to prove the identification.

Pierre's Cochin Chinese specimens of *C. tenuis* have the unsheathed stem 15–17 mm. in diam.; with the surface shining and glassy of a yellowish-green colour; the leaflets have 3 bristly nerves in the upper surface and are undistinguishable from those of the more characteristic Indian specimens, but they are without the small spinule at the base of the mid-costa. The 3-costate and not 1-costate leaflets easily distinguish *C. tenuis* from *C. Rotang.*

PLATE 94.—Calamus tenuis *Roxb.* Portion of a sheathed stem (on the right hand side) from a specimen collected by Sig. Fea in Burma (Herb. Becc.); portion of a stem with the bases of two leaves and of two spadices; an intermediate portion of a leaf (upper surface), from a specimen cultivated in the Botanic Garden at Buitenzorg and derived from Chittagong (in Herb. Becc.); an entire leaf with a fruit spadix (of a small plant) from a specimen collected at Barisal by C. B. Clarke (in Herb. Becc.); a branchlet of a male spadix with detached flowers, from Falconer's No. 1229 in Herb. Petr.; two female spikelets with young flowers from Chittagong,

in Herb. Kew: one seed from the back, another seed longitudinally cut in two halves, from the fruit spadix mentioned above.

77. Calamus horrens Bl. Rumphia iii, 4; Mart. Hist. Nat. Palm. iii, 333 Walp. Ann. iii, 483, and v, 830; Miq. Fl. Ind. Bat. iii, 115, and De Palmis, 27; H. Wendl. in Kerch. Les Palm. 236; Becc. Rec. Bot. Surv. Ind. ii, 206:

C. viminalis (not of Willd. nor of any other) Reinw. in Mart. l. c. iii, 335, and pl. U, f. 3.

Description.—Scandent, slender or of moderate size. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* gibbous above, armed with scattered, unequal, long or short, subulate, laminar, brown, spreading, solitary spines, which are usually obliquely inserted and are hollowed underneath in their broad base. *Ocrea* glabrous, short (6–10 mm. long), truncate, exsuccous, brown. *Leaf-sheath flagella* very slender, flattened and acutely two-edged in their lower portion, where scantily spinulous at the sides, armed upwards as usual with solitary or irregularly aggregate but not half-whorled claws. *Leaves* not cirriferous, about 1 m. in length; petiole about 15 cm. long, flat and smooth above, convex and armed below along the middle with black-tipped, straight, slightly deflexed spines and at the margins with other very unequal, straight, horizontal spines of which a few are 1–2 cm. long and others much shorter, but not hooked; the upper surface of the rachis, in its lower portion, is flat in the centre and channelled at the sides where are inserted the leaflets, and is smooth and acutely bifaced in its upper portion; the lower surface is convex and is rather densely armed at the sides with small and occasionally rather long, straight spines, and along the middle with a line of straight black-tipped slightly deflexed moderate spines, which are transformed towards the summit into solitary rather approximate claws; leaflets very numerous, equidistant and rather approximate, alternate or subopposite, linear-ensiform or very narrowly lanceolate, somewhat attenuate at the base, where suddenly plicate; very acuminate at the apex, subshining in the upper surface, very slightly paler beneath, tricostate, or with the mid-costa accompanied on each side with a secondary nerve stronger than the others, the three nerves furnished above with remote spadiceous bristles; the other secondary nerves smooth, one of these generally running in close proximity to or along the margins; in the lower surface the mid-costa slightly prominent and sparsely bristly-spinulous; margins rather closely and not very appressedly spinulous; transverse veinlets fine, much interrupted; the largest leaflets, the lower ones, 20–35 cm. long, and 15–17 mm. broad, the upper ones gradually decreasing in size; the two of the terminal pair quite free at the base, almost all furnished on the mid-costa near the base on the upper surface with 1–2 small, rigid spinules.—Other parts unknown.

Habitat.—The low land of Java on the sea coast near Batavia, *Blume.*

Observations.—I have seen a portion of a leaf from the authentic specimens of *C. horrens*, which has enabled me to recognize this species in some more complete specimens coming from the Botanic Garden of Buitenzorg, where they were cultivated under name of *C. stoloniferus.* Teysm. & Binn. The leaflets of the authentic, like those of the cultivated, specimens, are usually furnished on their mid-costa near the base, not very far from their insertion, in the upper surface, with one but sometimes with two small rigid and distinct spinules, a very peculiar character of great assistance in the identification. In fact, amongst all the species of *Calamus* I have examined, I have found this character only in *C. Rotang* and very frequently in *C. tenuis*, which, however, *C. horrens* so much resembles that I found it no easy matter to distinguish the one from the other. From what I can judge from the sterile specimens only, *C. tenuis* differs from *C. horrens* in the petiole being more frequently armed with deflexed and hooked spines, but in the leaflets I have been unable to discover the slightest difference between the two. Probably *C. horrens* must be considered as an insular form of *C. tenuis*, a relatively widely distributed species, but in the absence of the spadices and fruit of the first it is difficult to settle the question.

C. horrens in its vegetative organs approaches *C. Reinwardtii*, but the first has black-tipped spines, a short ocrea, and leaflets with 3 bristly nerves in the upper surface, beside the characteristic spinule, which however is occasionally absent in some leaflets of the same leaf.

C. stoloniferus Teysm. & Binn. is mentioned by Miquel (De Palm. 27), but nowhere have I seen a description of it.

To *C. horrens* I have also reduced *C. viminalis* of Reinwardt (Mart. l.c., not of Willd.) of which I have seen the specimens mentioned by Martius that are preserved in the Herbarium at Munich attached to two sheets of paper, the one labelled: "Java" by Reinwardt himself, the other "*C. viminalis* ex Reinw.: Celebes ubi Rotang Java dicitur, Reinwardt" in the handwriting of Martius. In these specimens the sheathed stem is hardly 1 cm. in diam. and the leaf-sheaths are less spinescent than in the typical forms; the leaflets, however, are furnished with the characteristic spinule. I have based my description mainly on the cultivated specimens from Buitenzorg, usually more robust than the wild ones; they have the sheathed stem 2 cm. in diam. and the leaf-sheaths bear many very small black-tipped spines, intermingled with the usual ones; these are long, very broad at the base, where they are almost callous above and concave beneath; but indeed the armature of the sheaths in this as in the typical forms of *C. tenuis* is very variable as to the number of the spines, not as to their nature. The leaves of the cultivated specimens have about 40 leaflets on each side and are 1·1–1·2 m. long, but sometimes do not exceed 80 cm.

PLATE 95.—Calamus horrens *Bl.* An intermediate portion of a sheathed stem with the base of two leaves and of two flagella, and intermediate portion of a leaf, upper surface; the summit of a leaf, under surface.—From a plant cultivated at Buitenzorg (Herb. Becc.).

78. CALAMUS GODEFROYI Becc. sp. n.

DESCRIPTION.—Scandent, slender. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* rather densely armed with broad-based, underneath concave, laminar, elongate-triangular, fringed-furfuraceous, black-tipped spines. *Ocrea* very short. *Leaves* not cirriferous, about 60 cm. long, ovate in outline. *Leaf-sheath flagella* very sparingly prickly in their basal portion; petiole 0; rachis flattish beneath where armed along the middle with small solitary black-tipped claws and in its basal portion with a few straight small spines at the sides; in the upper surface the rachis is acutely bifaced from a little above the base where more or less prickly; leaflets rather numerous (15–16 on each side) narrowly lanceolate, a good deal narrowed to and acute at the base, gradually acuminate at the summit, papyraceous, rather rigid, shining above, green, slightly paler beneath, the mid-costa rather acute above where provided chiefly near the base with a few rigid spinules and accompanied on each side by 3–4 secondary nerves; underneath the mid-costa bristly-spinulous and the side-nerves naked and sinuous; transverse veinlets much interrupted but rather distinct; margins finely spinulous; the largest leaflets, those a little above the base, 30–35 cm. long, 2·5 cm. broad, those near the mouth of the sheath narrower, but barely shorter, the others very speedily and gradually decreasing in length but not in breadth, less acuminate and with a distinct indentation on the lower margin a little below the apex; the two of the terminal pair free at the base, 10 cm. long, 8–12 mm. broad. *Male spadix* . . . . . . *Female spadix* laterally inserted near the mouth of the leaf-sheath with a distinct axillary callus, slender, flagelliform, rather rigid and strict, 1·2 m.–1·3 m. long, with very few and small (4–5) partial inflorescences and terminating in a short minutely clawed flagellum; primary spathes elongate, tubular, closely sheathing, usually decayed and brittle (not fibrous) at their summit; the lowest somewhat flattened, with rather acute smooth or slightly prickly margins and surface; the upper ones more cylindraceous, slightly enlarged above, armed externally in their attenuated or axial part with small black-tipped solitary claws; partial inflorescences erect, inserted just at or near the mouth of their respective spathes, the lower ones, the largest, 10–12 cm. long with very few (3–4) spikelets on each side; secondary spathes tubular and infundibuliform, somewhat angular by pressure, truncate at the mouth, slightly prolonged at one side into a small triangular point; spikelets inserted at the mouth of their respective spathes with a rather distinct axillary callus and its transversal rima, patent, arched, subscorpioid, rather rigid; the lower ones, the largest, 2–2·5 cm. long with 5–6 slightly assurgent (not perfectly flatly bifarious) flowers on each side; the upper ones speedily decreasing in length and number of flowers; spathels very shortly and broadly infundibuliform, truncate and entire; involucrophorum flat, disciform, almost horizontally subtended by its own spathel and inserted at the base of the one above; involucre flat, disciform, obsoletely 3-toothed; areola of the neuter flower very depressed, linear. *Female flowers* very small, about 2 mm. long. *Fruiting perianth* very shortly pedicelliform, the calyx flat and callous at the base; the corolla one-third longer than the calyx. *Fruit* sphæric, about 12 mm. in diam., not beaked, mammillate at its vertex; scales straw-yellow with a narrowly reddish-brown margin, shining, faintly channelled along the middle.

HABITAT.—Lower Cochinchina, where discovered by M. M. Godefroy-Leboeuf, 19th July 1879, on the flooded banks of the Great Lake near Siem Reap. (Herb. Kew).

OBSERVATIONS.—The specimens examined had only female spadices, whence all the fruits had fallen away, and of these only one, a detached and immature one, was preserved with the seed, where, however, the nature of the albumen cannot exactly be recognized. Supposing that the seed be with homogeneous albumen, I have placed this near *C. tenuis*, which it much resembles, differing, however, in its totally epetiolate leaves; but it also apparently approaches *C. Diepenhorstii*, which, however, belongs to a group where the seed is deeply ruminated.

PLATE 96.—Calamus Godefroyi *Becc.* Portion of a sheathed stem with an entire female spadix; lower portion of a leaf (upper surface); summit of a leaf (under surface); fragments of the fruit.—From the authentic specimen in the Herbarium at Kew.

79. CALAMUS ROTANG Linn. Sp. Pl. 1st edit. 325 and 2nd edit. 463 (the Ceylon plant only and excl. syn. Hort. Malab. and Herb. Amboin.); N. L. Burm. Fl. Ind. 84; Houtt. Nat. Hist. ii, 4, 445; Willd. Sp. Pl. ii, 202 (excl. syn. Lour.); Lam. Illustr. t. 770, f. 1; Roem. et Schult. Syst. Veget. vii, 2, 1322 (excl. all cit. but Linn. and Willd.); Roxb. Fl. Ind. iii, 777; Mart. Hist. Nat. Palm. iii, (1st edit.) 208 and 334, t. 116, f. 8 and t. ZXXII, f. XII; Blume Rumphia iii, 33; Walp. Ann. iii, 484 and v, 830; Miq. Fl. Ind. Bat. iii, 117; Gamble Man. Ind. Timbers, 423; Hook. f. Fl. Brit. Ind. vi, 447; Becc. in Rec. Bot. Surv. Ind. ii, 206.

C. Roxburghii Griff in Calc. Journ. Nat. Hist. v, 43 and Palms Brit. Ind. 55, t. CXCV A (under *C. fasciculatus*) and t. CXCII (by misprint CXII); Thw. Enum. Plant. Zeyl. 330.

C. monoecus Roxb. Hort. Beng. 73 ex Ind. Kew. Suppl. I.

C. monoicus Roxb. Fl. Ind. 783; Mart. Hist. Nat. Palm. iii (1st edit.), 209 and 334 (excl. descr. of Wallich No. 8604?); Griff. in Calc. Journ. Nat. Hist. v, 48 and Palms Brit. Ind. 58; Kunth Enum. Pl. iii, 208; Walp. Ann. iii, 484 and v, 830.

C. Scipionum Lam. (in part) Encycl. Bot. 304 (excl. syn. Lour. and Rheede).

Arundo Rotang Zeylanica spinosissima, major fructibus rotundis, etc. J. Burm. Thes. Zeyl. 36; Linn. Fl. Zeyl. 209, 468; Herm. Mus. Zeyl. 59.

Arundo nucifera Rotang dicta, fructu spadicei coloris striis purpureis venuste tessellato, Pluk. Almag. 53 (excl. syn. Clus.).

Phœnicoscorpiurus s. *Heliotropium Palmites spinosum* Pluk. Phytogr. t. 106, f. 1·2 (excl. Marcgr.).

Arundo Rotang dicta Pison. Ind. Orient. Mant. 188.

Arundo Indica versicolor flexilis, C. Bauh. Pin. 18, IV; J. Bauh. Hist. Plant. ii. 489; Raj. Hist. Plant. ii. 1277.

DESCRIPTION.—High scandent, rather slender. *Sheathed stem* 8–16 mm. in diam. *Leaf-sheath* gibbous above, glabrous, more or less armed with straight, obliquely inserted, horizontal or slightly ascendent, scattered, solitary spines which have a light base (this being tumescent above and hollowed beneath) and a blackish point; some of the spines are 10–15 mm. long, whereas others are very small and tuberculiform, sometimes a few near the mouth are erect and longer than the others. *Leaf-sheath flagella* very slender, with their lowest spathe flattened, acutely two-edged and usually smooth, irregularly clawed upwards. *Ocrea* short, truncate, brown, exsuccous, brittle, glabrous, unarmed or spinulous. *Leaves* not cirriferous, 40–80 cm. long; petiole very short or almost obsolete; rachis glabrous even in young leaves, in its first portion flat and smooth above, and channelled at the sides, where are inserted the leaflets, trigonous upward where acutely bifaced and smooth above, armed beneath along the middle and occasionally also at the sides with rather approximate always solitary black-tipped claws; leaflets very numerous, equidistant, alternate or subopposite, but sometimes with vacant spaces which are slightly longer than usual, narrowly or sublinear-lanceolate, somewhat attenuate at the base, very gradually acuminate at the apex, green and shining above, paler beneath, papyraceous, unicostate, but with many rather distinct secondary nerves; the costa usually but not always sprinkled above with a few rigid subspiny bristles of which in most cases 1–2 (situated near the base) are changed into rather robust spinules; the side-nerves always smooth; beneath, the bristles are also confined to the mid-costa; transverse veinlets short and interrupted, fine and distinct on the upper surface to which they give a tessellate appearance; margins ciliate, sometimes conspicuously, with spreading spinules; the largest leaflets, those a little above the base, 15–30 cm. long and 12–20 mm. wide; the upper ones gradually shorter, the two of the terminal pair the smallest and quite free at the base. *Male spadix* 0·6–1 m. long, slender, flagelliform, more or less ultradecompound or sometimes simply decompound, bearing up to the very summit rather many (even 7–8) partial inflorescences; these 10–20 cm. apart and gradually decreasing in size and number of spikelets from the base of the spadix upward; lowest primary spathe tubular, flattened, acutely two-edged, smooth or armed at the side with straight spines; the other primary spathes cylindraceous, very slightly enlarged above, closely sheathing, truncate at the mouth, where extended at one side into a very short point, attenuate at the base, where flat on the inner side and armed on the back with claws which are stronger than in the upper part; partial inflorescences loosely panicled-pyramidate, arising erect from inside their own spathe, then spreading and arched downwards; the largest, the lower ones, 15–17 cm. long, with 2–3 arched branchlets at the base and 5–6 simple spikelets upwards on each side and terminating in a spikelet longer than the side ones and with the flowers more distant than in these; secondary spathes very narrowly tubular-infundibuliform, glabrous, very finely striately veined, smooth or furnished with one or two straggling spinules, obliquely truncate at the mouth, apiculate at one side; spikelets inserted above the mouth of their own spathe with a distinct axillary callus, spreading or somewhat deflexed, arched or subscorpioid; the larger ones, the lowest, 12–25 mm. long, with 5–12 flowers on each side; the upper ones shorter and with fewer flowers; spathels with a very short narrow cylindraceous base and very suddenly expanded into a broadly infundibuliform striately veined truncate limb, this ciliolate at the margins, and shortly apiculate at one side; involucre cupular, not or slightly exceeding the spathel, truncate, entire, obsoletely trigonous or sub-three-toothed. *Male flowers* distichous, inserted at an angle of 45°, approximate, subtrigonous-ovate, acute, 3·5 mm. long; the calyx cylindraceous, smooth and callous at the base, very finely striately veined, divided down not quite to the middle into 3 triangular acute lobes; corolla twice as long as the calyx, divided to a little above the base into 3 ovate-lanceolate apiculate finely striate segments; stamens with the filaments connate by their bases to the tubular portion of the corolla, then free and subulate with the apices inflected when in the bud; anthers elongate-sagittate; rudimentary ovary formed by 3 subulate bodies, which reach a little above the bases of the anthers. *Female spadix* flagelliform, simply decompound, terminating in a more or less elongate aculeolate flagellum; primary and secondary spathes like those in the male spadix; partial inflorescences arising erect from inside their own spathe, then arched, short, the larger ones usually 15–20 cm. long with 5–8 spikelets on each side and a terminal one; spikelets alternately distichous, slender, 15–20 mm. apart on each side, strongly arched or subscorpioid, attached just at the mouth of their own spathe with a distinct axillary callus; the larger ones 3–5 cm. long with 5–7 rather remote flowers on each side, the upper ones somewhat shorter; spathels tubular-cylindraceous at the base, more or less infundibuliform in their upper part, truncate, finely striately veined, apiculate at one side; involucrophorum sub-cupular, sessile, almost completely exsert from its own spathel and laterally attached to the base of the one above; involucre shallowly cupular with a somewhat irregular and obsoletely toothed margin; areola of the neuter flower depressedly lunate. *Female flowers* small, conic-ovoid, 2·5–3 mm. long; the calyx callous and smooth at the base, strongly striately veined on the tube, shortly 3-toothed; the corolla scarcely longer than the calyx, its segments ovate-acute; the stamens with the filaments united by their bases and with rather large sterile anthers; these deeply sagittate at the base, obtuse at the summit. *Neuter flower* conspicuous, divaricate, only slightly smaller than the fertile ones. *Fruiting perianth* shortly but distinctly pedicelliform. *Fruit* globose or slightly longer than broad, 12–13 mm. broad, 13–15 mm. long, shortly and minutely apiculate; scales in 21 series, rhomboid, almost as long as wide, of a light straw colour, shining, faintly or very faintly channelled along the middle, with a rather short and obtuse reddish-brown point; the margins finely erosely toothed, pale or with a not very distinct darker intramarginal line. *Seed* with the integument fleshy when fresh, very thinly crustaceous when dry, orbicular, compressed, somewhat convex, irregularly pitted and tubercled on the back, radiately grooved from a central rather large circular chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—Common in the hottest parts of the Island of Ceylon, *Thwaites* C. P No. 3388; and in the southern districts of the Indian peninsula, from whence I have seen specimens collected on the Coromandel coast at Madras, *Wight* in Herb. Kew; in the districts of Nellore, Chingleput and Kurnool, *Gamble*, and at Courtallum, *Wight* No. 2757 in H. Kew. Roxburgh assigns also the locality Bengal, but from there I have seen no specimens. The common Rattan. Vernacular names: "Bet" and "Chachi Bet" Beng. Ind.; "Pepa" and "Prabba," Central Provinces (Gamble).

OBSERVATIONS.—The name of *C. Rotang* has been given by Linnæus to a *Calamus* collected by Burmann in Ceylon, of which I have seen some instructive fragments in the Herbarium Delessert at Geneva. Therefore though *C. Rotang* be common also in the southern part of the Indian peninsula, the type-specimens must be considered as those coming from Ceylon. In these I have always found the leaflets with the mid-costa without bristles in their upper surface and usually also devoid of the spinule which is always present in the continental specimens. Perhaps also in these last the male flowers are slightly longer, but otherwise I have been unable to find any differences between the Ceylon and the Indian specimens. Roxburgh has described *C. Rotang* on specimens coming from the Coromandel coast, and on these Griffith had established his *C. Roxburghii*, a name which in any case ought to be assigned to the continental form of *C. Rotang*, if it were possible to discover specific differences between that and the Ceylon plants.

Following Blume I am of opinion that *C. monoicus* is exactly the same thing as *C. Rotang* (*C. Roxburghii* Griff.), since evidently Plate CXII (CXCII' which is taken from a drawing of Roxburgh (see Griffith, l. c. p. ix), reproduces the *C. monoicus* of this author and is a rather good representation of the ♀ plant of *C. Rotang*. I consider also as belonging to *C. Rotang* the other plate of Griffith's work No. CXCV A, published with the name of *C. fasciculatus* which is also reproduced from a drawing of Roxburgh. The likeness of the two plates is evident; only this last apparently represents a diœcious plant, as there has been added a female partial inflorescence where the companion flower at each spathel, usually sterile in the other species of *Calamus*, is here apparently fully developed and expanded, while in the other inflorescences the companion flower had fallen and only the female flowers and ovaries in course of developement are to be seen on it. As that plate in the work of Griffith was meant to represent *C. fasciculatus*, the clustered arrangement of the leaflets has probably been exaggerated in the reproduction; doubtless also the deep indentations on the margins of the leaflets, a peculiarity not observed in any of the species of *Calamus* known to me, are fanciful. I have not seen living plants of *C. Rotang*, and in the specimens of these species at my disposal I have not observed female partial inflorescences where the companion flower of the female flower was expanded as would appear to be the case with *C. Rotang*, judging from the plate quoted above. In all the species of *Calamus* seen by me the companion flower, though sometimes fairly developed, remains closed, but I do not see any impossibility that in *C. Rotang*, and perhaps in some other species, that flower may be so well formed as to expand its corolla.

Most certainly *C. monoicus* is nothing more than the male plant of *C. Rotang* at the moment when the female and the companion flower (male or neuter?) are on the spadix.

I may mention that I never have had occasion to observe an absolutely monœcious species of *Calamus*, or one which never produces exclusively male spadices. I have, however, observed in *C. luridus* and perhaps in some other species that the female inflorescences sometimes produce at their extremities a few spikelets with male flowers only.

C. Rotang greatly resembles *C. tenuis*, from which, however, it is very clearly distinct, by its leaves almost without petiole and with unicostate leaflets; the fruit also, though externally very similar in the two, has the seed globular in *C. tenuis* and flattened or sublenticular in *C. Rotang*. The ♀ spikelets of *C. Rotang* have the axis slightly zig-zag sinuous, the spathels rather elongate and therefore the flowers rather remote and the involucrophorum not at all pedicelliform; its male flowers are of the usual kind, spreading and bifarious in flattened spikelets, and in the female spikelets, the companion or sterile flower is divaricate or makes a wide angle with the female one; and consequently the female spikelets, even when young, never have the flowers arranged in four series as in *C. tenuis*.

PLATE 79.—Calamus Rotang *Linn.* Portion of a sheathed stem with bases of the leaves, summit of a leaf and male spadix, from a specimen originally coming from Ceylon and cultivated at Buitenzorg (Herb. Becc.); an intermediate portion of a leaf (upper surface); the summit of a fruit spadix; mature fruit and seed, one of these longitudinally cut, from a specimen gathered by Gamble in the Chingleput district, Madras Presidency (Herb. Becc.).

80. CALAMUS WALKERII Hance in Journ. Bot. xii (1874), 266; Becc. in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—Probably scandent and of moderate size. *Stem* and *leaf-sheaths* . . . . . *Leaves* petiolate, not cirriferous, 1–1·30 m. long (Hance); rachis in its intermediate and terminal portion trigonous, smooth and acutely bifaced above, flattish beneath, where armed chiefly along the middle with rather stout straight or slightly curved, somewhat deflexed black-tipped spines, which sometimes are even 2 cm. long; leaflets very numerous, equidistant, alternate or subopposite, 22–24 mm. apart, yellowish-green, concolorous on both surfaces, ensiform, attenuate and deeply plicate at the base, gradually acuminate from about the middle into a subulate and bristly apex, superficially indented on the lower margin near the summit, with 3 distinct costae, these acute and furnished with long bristles on the upper surface and usually naked beneath; secondary nerves slender, rather numerous and rather distinct on both surfaces, always naked; margins remotely and appressedly spinulous, somewhat thickened by secondary nerves; transverse veinlets rather distinct above, very crowded; the largest leaflets (amongst those seen by me) 38 cm. long, 25 mm. broad (Hance gives 8–20 inches by 6–12 lines); the upper ones shorter; the two of the terminal pair united by their bases. *Male spadix* . . . . . *Female spadix* decompound, elongate, prolonged into a terminal flagellum which is strongly armed with half-whorled claws; primary spathes tubular, closely sheathing, the lowest acutely two-keeled and irregularly armed at the base with very variable spines; the upper ones more or less clawed, very obliquely truncate and extended at one side at the mouth into a bristly-penicillate tip; partial inflorescences few (2–4, Hance), erect, rather compact, pyramidate, the larger ones about 20 cm. long and furnished distichously on each side with 18–20 approximate, gradually but speedily shortening spikelets; secondary spathes short, cylindraceous, truncate at the mouth and prolonged at one side into an elongate bristly tip; spikelets inserted just above the mouth of their own spathe with a distinct axillary callus, horizontal, filiform, slightly-arched; the largest, the lower ones of each inflorescence, 6–7 cm. long with 15–16 distichous flowers on each side; the upper ones a good deal shorter (about 2 cm.); the flowers inserted at an angle of about 45°. *Fruiting perianth* . . . . . *Fruit* (from Hance's description) small, ovoid, apiculate, 12 mm. long; scales in 18 series, of a very light straw colour, not channelled along the middle, with a narrow dark marginal line; *seed* flattened, coarsely sinuously grooved on the back; chalazal fovea indistinct; albumen equable; embryo basal.

HABITAT.—Not uncommon in several parts of the Island of Hong-Kong, *Hance.*

OBSERVATIONS.—I have seen one of Hance's specimens, No. 18229 in St. Petersb. Herb. It seems allied to *C. viminalis*, but with equisdistant leaflets.

PLATE 98.—Calamus Walkerii *Hance.* Basal portion of a female spadix with an entire partial inflorescence; an intermediate portion of a leaf. From Hance's type specimen in St. Petersb. Herb.

81. CALAMUS FABERII Becc. sp. n.

DESCRIPTION.—Apparently scandent and rather slender or of moderate size. *Stem* and *leaf-sheaths* . . . . . *Leaves* not cirriferous, apparently about 1 m. long (only the summit of one seen by me); petiole . . . . . ; rachis in its terminal portion acutely trigonous, bifaced above with acute and smooth upper angle, flat beneath where armed with small approximate solitary dark-tipped claws; leaflets numerous, equidistant, rather approximate, firmly papyraceous, opaque and subconcolorous on both surfaces, linear-lanceolate, attenuated to the base, gradually acuminate to the summit, with 3 distinct bristly costae above; beneath the mid-costa only with a few long bristles; transverse veinlets not very approximate, short and much interrupted; the margins, especially the lower one, slightly thickened by a marginal nerve, minutely and very appressedly spinulous; the lowest leaflets of the apical portion of the leaf seen by me (27 cm. in length and with 11 leaflets on each side) 22 cm. long, 17 mm. broad; the others rather speedily decreasing in length and less acuminate; the two of the terminal pair, the smallest, quite free at the base. *Male spadix* . . . . . *Female spadix* simply decompound, elongate, flagelliform (apparently flagelliferous at its summit) with many remote partial inflorescences, and with the attenuated part (base of the spathes) between two partial inflorescences rather powerfully armed with solitary or more or less aggregate dark-tipped claws; upper primary spathes tubular, elongate, cylindraceous, very closely sheathing, more or less prickly, truncate or shortly split at the mouth and slightly prolonged at the summit into a short triangular point; partial inflorescences apparently rather numerous, inserted inside and issuing erect from their respective spathe, rather rigid, pyramidal in outline, 12–18 cm. long with about 10 spikelets on each side; secondary spathes cylindraceous, closely sheathing, unarmed, truncate at the mouth and prolonged at one side into a triangular very acute point; spikelets inserted just at or a little above the mouth of their own spathes, slightly arched, horizontal or deflexed, filiform; the lower ones 5–6 cm. long with 12–13 flowers on each side, the others speedily decreasing in length, those of the summit very short and with very few flowers; spathels cylindraceous at the base, rather suddenly expanded into a short truncate infundibuliform limb, distinctly apiculate at one side; involucrophorum laterally attached outside its own spathel at the base of the one above, scale-like, subdiscoid, almost explanate; involucre also scale-like, asymmetric and almost explanate; areola of the neuter flower linear, depressed. *Female flowers* bifarious, small, about 3 mm. long, with the corolla almost twice as long as the calyx. *Fruiting perianth* shortly pedicelliform, the calyx callous at the base, divided down almost to the middle into 3 broadly triangular lobes; the segments of the corolla ovate-acute, nearly twice as long as the calyx. *Fruit* small, ovoid, conic at the summit when very young (not seen mature); scales in 18 series, straw-yellow at the base, broadly bordered by reddish-brown; the margins narrowly scarious and finely erosely toothed, convex and not channelled along the middle (at least in the very young fruit).

HABITAT.—Collected by *Faber* in China (lower?). Herb. Vindob.

OBSERVATIONS.—This seems allied to *C. Walkerii*, from which it differs in the leaf-rachis armed only with claws, and in the more elongate spadices with more numerous smaller and more diffuse partial inflorescences. Very few species of *Calamus* have the corolla of the female flowers so conspicuously longer than the calyx as in this species. The exact locality where this species was collected is not stated on the label accompanying the specimen in the Herbarium Musei Palat. Vindobonensis.

PLATE 99.—Calamus Faberii *Becc.* The summit of a leaf (upper surface); portion of the spadix with entire partial inflorescences bearing immature fruit.—These parts constitute Faber's type-specimen as seen by me in the Herb. Vindob.

82. CALAMUS TONKINENSIS Becc. sp. n.

DESCRIPTION.—Not scandent, bushy. *Stem* erect, about 1 m. high (Balansa). *Leaf-sheaths* . . . . . *Leaves* (not seen entire) apparently rather large, quite glabrous; petiole . . . . . ; rachis in the intermediate portion subtrigonous, acutely bifaced and smooth above, slightly convex beneath, where armed with straight, 10–15 mm. long, slender deflexed spines, which have a fuscous tip and a light base and leave a deep impression above them; leaflets apparently numerous and equidistant, 2·5 cm. apart on one of the sides of the rachis and 3·5 on the other side, opaque, pale-greenish or sub-glaucescent when dry, concolorous on both surfaces, papyraceous, rigidulous, narrowly ensiform, 30–40 cm. long, 18-19 mm. broad, somewhat narrowed to the base and from the middle upwards gradually acuminate into a sparingly bristly-spinulous tip; this slightly indented on its lower margin, very distinctly 3-costate with another rather strong nerve near each margin and therefore sub-5-costate; on the upper surface the 3 main costae of about the same strength, the central one naked and the side ones furnished with a few short bristles from the middle upwards; underneath the costae are naked and not very conspicuous; margins very appressedly and inconspicuously spinulous; transverse veinlets fine not very crowded, much interrupted. *Male spadix* . . . . . *Female spadix* partially supradecompound, apparently very large and with many partial inflorescences; primary spathes tubular, closely sheathing, thinly coriaceous, one of the lowest spathe somewhat flattened, striate longitudinally, two-edged (the edges spinulous), decayed and brittle at the summit (not fibrous or filamentose); the axial portions between two partial inflorescences elongate, subcylindraceous or slightly flattened more or less armed on the outer side with solitary or 3-nate claws; partial inflorescences arising erect from their own spathe, then arched, densely panicled, elongate-ovoid, one of the lowest about 30 cm. long, with 12 spikelets on each side, of these the lower ones compound, viz., branched into a few secondary spikelets, the others gradually diminishing, the intermediate ones 6–8 cm. long. with 12–14 flowers on each side, those of the summit 2–3 cm. only; secondary spathes tubular-infundibuliform, truncate, apiculate at one side and densely ciliate with brown deciduous bristles at the mouth; spikelets spreading or horizontal, attached slightly outside the mouth of their own spathe, their axis slender, cylindraceous, 1–2 mm. thick; spathels cylindraceous at the base, suddenly expanded into a short broadly infundibuliform truncate limb, which is ciliate at the mouth at the secondary spathes; involucrophorum attached laterally outside its own spathel at the base of the one above, very short, subdiscoid, with a narrow annular limb; involucre discoid, tumescent, with a very narrow annular limb; areola of the neuter flower not very distinct, depressed. *Fruiting perianth* shortly but distinctly pedicelliform; the calyx broadly 3-dentate, callous at the base; the segments of the corolla almost twice as long as the calyx. *Fruit* small, broadly ovate, mucronulate, 10–11 mm. long, 8 mm. broad; scales shining, rather convex, not channelled along the middle, very pale with a narrow intramarginal fuscous line; margins narrowly scarious, finely erosely-toothed. *Seed* ovoid, slightly flattened, 7 mm. long, 6 mm. broad, 5 mm. thick, convex, coarsely irregularly and superficially pitted on the back; chalazal fovea superficial, indistinct; albumen equable; embryo basal.—Other parts unknown. The different parts of the plant retain, in Herbarium specimens, a greenish, almost glaucescent hue.

HABITAT.—Tonkin at Taukeiun near Zuang-yen, *Balansa* (No. 516 in Herb. St. Petersb. and Herb. Kew), collected on 15th September 1885.

OBSERVATIONS.—Known by the very fragmentary fruit specimens distributed by Balansa. Distinct by its bushy not scandent habit; the leaves with numerous equidistant ensiform 3-costate leaflets; the leaf-rachis armed with straight long deflexed spines; the supradecompound female spadix with panicled, rather dense partial inflorescences; the small ovoid fruit. Its affinities, however, are not very apparent; it has somewhat the facies of *C. fascicularis*.

PLATE 100.—Calamus tonkinensis *Becc.* An intermediate portion of a leaf (upper surface); portion of the spadix with an entire partial inflorescence bearing mature fruit; detached seeds, one longitudinally cut through the embryo.—The parts mentioned above constitute the entire type-specimen in the St. Petersburg Herb.

83. CALAMUS DELESSERTIANUS Becc. sp. n.

DESCRIPTION.—Probably scandent and of moderate size. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* rather large; petiole 50; rachis in its upper portion subtrigonous, slightly convex beneath, where armed along the middle and near the margins with rather strong, numerous, solitary, light-based and black-tipped not much hooked claws, bifaced on the upper surface, where armed with ascendent spinules on the angle; leaflets in the small portion seen by me (8 cm. of rachis, probably taken from above the middle) equidistant, rather closely set at an angle of about 45° (4 on one of the sides and 3 on the other), papyraceous, rigidulous, elongate-ensiform, 32–35 cm. long, 20–22 mm. broad, rather suddenly narrowed at the base, callous at the insertion in their upper axilla next to the axis, and in the small cavity formed underneath by the folding of the base of the leaflets where they are rusty-furfuraceous, quite glabrous on the remainder, pale-green when dry and subconcolorous on both surfaces, shining above, opaque beneath, long and gradually narrowed into a slightly bristly and not very acuminate tip, this rather deeply indented on its lower margin, sub-5-costate, or with 3 acute costae in the centre and a rather distinct secondary nerve on each side of them; further another secondary nerve runs alongside the lower margin; on the upper surface the 3 main costae are furnished with long bulbous bristles, which are less numerous on the mid-costa than on the side ones and are brown at their base and lighter upwards; the other two nerves are usually naked but sometimes also spinulous; on the lower surface the nerves are all less prominent than above and only the mid-costa is bristly; transverse veinlets not very conspicuous; margins closely spinulous throughout and contrary to the rule the spinules more spreading, closer and stronger near the base than towards the summit; sometimes a small spinule occurs at the base of the mid-costa in the upper surface as in *C. tenuis*. *Male spadix* . . . . . *Female spadix* probably rather large, not seen entire; in one specimen of a partial inflorescence with a primary spathe, this coriaceous, pale-green even when dry, tubular-cylindraceous, closely sheathing, slightly enlarged above where split on one side, truncate and naked at the mouth, slightly prolonged at one side into a triangular keeled point; its surface almost polished and glabrous, smooth lower down and rather densely armed in its upper portion with very small, very short, broad-based, horizontal or slightly hooked prickles which are more numerous near the summit; the partial inflorescence is attached inside near the mouth of its spathe, arising erect at first, then spreading, 30 cm. long, with 13 distichous spikelets on each side; secondary spathes tubular-infundibuliform, loosely sheathing, covered with a rusty-furfuraceous removeable scurf, unarmed, horizontally truncate at the mouth, where (during anthesis) closely ciliately paleaceous, not or indistinctly apiculate on one side; spikelets inserted just at the mouth of their respective spathes, with a distinct axillary callus, rather slender but rigid, arched, spreading or deflexed, the 2–3 which are near the base slightly branched, the next above these about 6 cm. long with about 20 flowers on each side, the others gradually diminishing, those of the summit 2 cm. in length with only 8–9 flowers on each side; spathels very shortly asymmetrically infundibuliform, striately veined, truncate and ciliolate at the margin, prolonged at one side into a broad acute deflexed point; involucrophorum almost exsert from its own spathel, attached laterally at the base of the one above, subbracteiform, subannular, unilaterally evolute, flattish; involucre like the involucrophorum but evolute on the opposite side. *Female flowers* very regularly bifarious, rather approximate, inserted at an angle of 45°, about 3 mm. long, subcylindraceous or slightly conic; the calyx tubular, flat, smooth and callous at the base, its tube strongly striately veined with 3 short broad acute teeth; the segments of the corolla acute, slightly longer than the calyx; the stigmas recurved lamellose. *Neuter flowers* slender, as long as the female ones but with the corolla twice as long as the calyx.—Other parts unknown.

HABITAT.—This fine species is probably a native of the southern provinces of the Indian peninsula. In the Herb. Delessert it is labelled "*C. gracilis* Roxb.; Ind. Orient., Dr. Roxburgh."

OBSERVATIONS.—I have seen of this only a small portion of a leaf with 8 cm. of rachis and 7 leaflets, apparently detached from above the intermediate part of the leaf. It is curious that this species, which was found in the time of Roxburgh, has not been collected again by modern botanists. It seems to me that the *Calami* in Lower India are more scarce now than in past times, perhaps on account of the greater extension given to cultivation and owing to the destruction of the forests.

C. Delessertianus seems related to *C. Brandisii*, but it differs from this, as from any other South Indian species known to me, by its numerous equidistant ensiform sub-5-costulate leaflets; the closely sheathing tubular coriaceous primary spathes, and the elongate spikelets; the bracteiform involucrophorum and the numerous perfectly bifarious flowers.

PLATE 101.—Calamus Delessertianus *Becc.* Portion of a leaf probably from above its middle; one partial inflorescence with the upper part of its spathe.—The entire Roxburghian specimen in Herb. Deless.

84. CALAMUS BRANDISII Becc. in Hook. f. Fl. Brit. Ind. vi, 448, and in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—Scandent and slender. *Sheathed stem* 10–15 mm. in diam. *Leaf-sheaths* flagelliferous, slightly gibbous above, densely armed with very unequal (3–15 mm. long), scattered, deflexed, schistaceous, slender needle-like spines, which rest on a small tumescent subtuberculiform base; the mouth and the very short ocrea very densely furnished with numerous bristly or criniform fulvous spiculae of which some are even 5 cm. in length. *Leaves* not cirriferous, short, in one specimen 55 cm. long; the petiole 15 cm. long, flat and smooth above, convex beneath, the margins acute and conspicuously armed with a few very long (3–4 cm.), straight, slender, rigid, needle-like horizontal pale spines; rachis immediately above the insertion of the first leaflets acutely trigonous, smooth on the upper angle, armed beneath with a few very strong, solitary, 2–3 cm. long, deflexed, light-coloured spines; leaflets very few, in one leaf 15 in all, very distinctly fascicled, 6 of them radiately approximate at the summit, narrowly or elongate-lanceolate, papyraceous, rather firm, subshining, concolorous or slightly paler beneath, somewhat attenuate at the base, where not very acute, acuminate at the summit into a bristly-spinulous apex, with the mid-costa acute above, where very sparingly spinulous and accompanied on each side by two rather distinct secondary nerves of which one, that nearer the mid-costa, is usually furnished with a few spinules; beneath the mid-costa and the secondary nerves smooth; margins rather densely ciliate with spreading short spinules; the largest leaflets, the intermediate ones, 25–27 cm. long, 20–25 mm. broad, the upper and the lower ones somewhat shorter but not narrower, the two of the terminal pair shortly united at the base. *Male spadix* . . . . . *Female spadix* elongate, flagelliform (about 80 cm. in length), terminating in a slender aculeate flagellum and with few (4) partial inflorescences; primary spathes narrowly tubular, closely sheathing; the lowest flattened, acutely two-edged, smooth or sparingly spinulous, prolonged at the summit into a lanceolate point and bristly bearded at the mouth; upper primary spathes cylindraceous, narrowed at the base, where flat on the inner side, convex and clawed on the back, and also but very sparingly in their upper part, with a lanceolate acuminate limb at their summit; partial inflorescences (when in flower) arising erect from inside their own spathe, rather rigid, the lower ones the largest, 15–20 cm. long, and with a very small and short caudiculum at their summit, furnished with 5–6 spikelets on each side; the upper ones shorter, the terminal with 3–4 spikelets in all; secondary spathes tubular-infundibuliform, 8–15 mm. long, unarmed, finely striately veined, obliquely truncate, ciliate and entire at the mouth, prolonged at one side into a triangular subulate point; spikelets inserted just at the mouth of their own spathe, rather thick and short, erecto-patent when in flower, slightly arched, all of about the same dimensions, the largest, the lower ones 2·5–3 cm. long, with 8–10 flowers on each side, the upper ones with rather fewer flowers; spathels very closely packed, concave, broad, bracteiform, striately veined and prolonged at one side into a triangular subulate deflexed point; involucrophorum supported by the spathel, irregularly cupular, more or less unilaterally evolute; involucre also cupular, strongly veined, more or less irregular or unilaterally evolute; the spathels and the involucres more or less ciliate at the margin; areola of the neuter flower depressedly lunate, somewhat concave, with very sharp and subwinged borders. *Flowers* very crowded, distinctly 4-seriate in young spikelets on account of the conspicuous neuter flowers. *Female flowers* conical-ovoid and acute when in bud, 3 mm. long; the calyx shortly cylindraceous, smooth and callous at the base, coarsely veined on the tube, its teeth short, broad, with thickened scarious margins; corolla one-third longer than the calyx, the segments ovate-lanceolate acute. *Neuter flowers* almost as long as the female ones, but thinner and with the corolla a good deal longer than the calyx. *Fruit* unknown.—The leaf-sheaths, the petiole and rachis more or less covered in youth with a brown furfuraceous detachable indumentum.

Habitat.—Lower India. Discovered by *Sir D. Brandis*, in February 1882, at 1500 alt., on the Ghats near Courtallum in Travancore.

Observations.—A very distinct and remarkable species, by its short leaves with few elongate-lanceolate clustered leaflets; the petiole and rachis armed with remote straight solitary and long spines; and the mouth of the leaf-sheaths and the ocrea furnished with long bristly spiculae.

Plate 102.—Calamus Brandisii *Becc.* The summit of the stem with an entire leaf; two detached female flowering spadices.—From Brandis's specimen in Herb. Becc.

85. Calamus salicifolius Becc. in Rec. Bott. Surv. Ind. ii, 206.

Description.—Busby, very small, 1–2 m. high. *Sheathed stem* 6–8 mm. in diam. *Leaf-sheaths* (of the upper part of the fertile stem) often furnished, when not bearing spadices, with a very rudimentary flagellum which sometimes is not more than 1 cm. in length, gibbous above, striate longitudinally, armed (sometimes very sparingly) with scattered solitary, horizontal, rigid, subulate, straight, dark-tipped spines which are 5–10 cm. long and rest on a swollen pale base; with these spines are often intermingled other short and subtuberculiform prickles, usually more numerous near the base of the petiole. *Ocrea* truncate, very short, 3–5 mm. long, bristly-hispid. *Leaves* not cirriferous, but with diminutive leaflets at the apex, small, 20–30 cm. long; petiole very short or obsolete; rachis flat near the base and bifaced upwards above, where throughout its length more or less furnished along the middle with a line of small, remote, rigid, straight, black-tipped slender spines, convex underneath, where armed with black-tipped, solitary, comparatively strong and rather long claws; leaflets small and few, pointing in different directions, distinctly grouped into 5–6 remote fascicles of 4–6, these formed by 2–3 leaflets on each side of the rachis which are divergent and almost in contact by their bases; the fascicles of one side 5–6 cm. apart and subopposite to those of the other side; the largest leaflets, those of the basal groups, 5–10 cm. long, 8–15 mm. broad, the others gradually smaller, the two of the terminal pair only 2–3 cm. in length, free at the base; all very rigid, thinly coriaceous, dull, light-green and sub-glaucescent on both surfaces, finely grey-furfuraceous beneath, lanceolate, equally narrowed to both ends, acute and plicate at the base, where more or less callous at their insertion, the apex acute or subobtuse, the mid-costa acute and furnished above with 1–5 erect, needle-like, black, rigid spines, smooth and not prominent beneath; side-nerves very slender, naked on both surfaces; margins ciliate, chiefly near the apex, with rigid patent spinules; transverse veinlets rather sharp and much interrupted in the upper surface, indistinct beneath. *Male spadix* simply decompound, about as long as the leaves, rigid, erect, not cirriferous, with few (4 in one specimen) partial inflorescences; primary spathes tubular, narrow closely sheathing and sparingly prickly in their lower portion, somewhat enlarged and loose above, where open longitudinally on the ventral side and terminating in an elongate, lanceolate, subauriculiform, acute, exsuccous, reddish-brown (not lacerated) limb; the lowest primary spathe not differing from the others, only larger and with a flattened spinous acutely two-edged base; partial inflorescences short, rather dense, pyramidate, issuing erect from and half-embraced by their respective spathes; the lower ones, the largest, 4–5 cm. long with very few (4–5 on each side), speedily decreasing subscorpioid spikelets; secondary spathes apparently concrete with the axis of the inflorescence, free at the summit where bracteiform and acute at one side; spikelets subscorpioid, the lower ones, the largest, with two slightly unilateral series of 8–10 approximate flowers each; spathels bracteiform, triangular, acute, deflexed; involucre almost horizontally subtended by its own spathel, almost flat, obsoletely 3-toothed. *Male flowers* ovoid, somewhat irregular by mutual pressure. *Female spadix* very similar to the male, rigid, erect, about as long as the leaves, not cirriferous, with 3—4 partial inflorescences and with a small tail-like filiform aculeolate appendix at its apex; primary spathes exactly as in the male spadix; partial inflorescences short, rigid, issuing erect from their own spathe, and then patent, panicled-pyramidate, with 4–6 spikelets on each side, slightly unilateral and somewhat turned upwards, and terminated by a recurved and subscorpioid spikelet; the lowest spikelets usually branched at their base and the upper ones speedily decreasing in length and number of flowers; the axis of the inflorescences relatively thick, more or less angular; secondary spathes concrete with the axis, bracteiform at their summit and acute at one side; spikelets inserted above the mouth of their own spathels with a distinct swollen axillary callus, arched-subscorpioid, the lower ones 15–20 mm. long with 10–14 flowers in all, those of the summit with 4–6 flowers only; spathels broad, bracteiform, acute at one side, pushed down by the flowers; involucrophorum and involucrum subconform, flat; involucre with a large round scar in the centre and a narrow subcircular obscurely-toothed limb; areola of the neuter (or male and fertile?)

flower very depressed, linear. *Female flowers* disposed in two collateral series (not flatly bifarious) and pointing upwards, ovate, 3 mm. long; the calyx coarsely striately veined, flat at the base with a short tube, teeth very broadly triangular, acute; the corolla one-third longer than the calyx, divided into 3 ovate, apiculate segments; filaments of the stamens united at the base into a ring which is crowned by 6 triangular subulate teeth. *Neuter* (or fertile and male?) *flowers* 3–3·5 mm. long, ovate-lanceolate; the calyx deeply divided into 3 concave broad lobes; the corolla twice as long as the calyx, narrow and tubular at the base, divided into 3 oblong segments; the stamens with sagittate, acute, apparently well-formed and fertile anthers. *Fruiting perianth* shortly pedicelliform. *Fruit* (when not quite ripe) globular, 10 mm. in diam., topped by a short stout beak; scales in 18 series, yellowish, subshining, broader than long, with a very obtuse or round point and a reddish-brown, more or less distinct marginal line, the margins erosely toothed. *Seed* pisiform, irregularly globose; albumen equable; embryo basal.

HABITAT.—Cochinchina: discovered by L. Pierre at Tong-Keon near Saigon, in February 1865, *Pierre* No. 4853; also at Saigon, on the banks of the river, *Germain* (1879) in Herb. Delessert and *Godefroy-Lebœuf* (1874) in Herb. Kew, male specimen.

OBSERVATIONS.—A small bushy not scandent species, very distinct by its short leaves with 5–6 fascicles of segments of the shape and size of certain willow leaves or of those of the olive tree, with the mid-costa furnished above with a few, relatively long, strong and black spines. It is also very unusual for the female flowers to be accompanied by a well-developed and apparently fertile male flower.

This seems a non-cirriferous species, derived from the cirriferous ones of group XV; it is therefore artificially placed in group V.

PLATE 103.—Calamus salicifolius *Becc.* The summit of a stem bearing a spadix with not quite mature fruit.—From *Pierre* No. 4833 in Herb. Beccari.

CALAMUS SALICIFOLIUS var. LEIOPHYLLUS Becc.

DESCRIPTION.—Differs from the type only in the leaflets being almost without spines on the mid-costa and with the margins quite smooth or very remotely spinulous.

HABITAT.—Cochinchina: Campong Chuong in Camboja, *Otto Kuntze* No. 3995 in Herb. Kew.

86. CALAMUS TETRADACTYLUS Hance in Journ. Bot. xiii, 1875, 289; Becc. in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—Slender, not very high scandent. *Sheathed stem* 6–10 mm. in diam. *Leaf-sheaths* faintly gibbous above, wholly unarmed or very scantily armed with horizontal or slightly deflexed pale straight 8–10 mm. long spines, which leave a deep impression on the sheath. *Ocrea* 5–6 mm. long, exsuccous, smooth, truncate and glabrous at the mouth. *Leaf-sheath flagella* filiform, slender, rather densely armed with fine, often irregularly confluent claws. *Leaves* not cirriferous, rather short, about 45 cm. long; petiole very short, flat above, smooth or with a few prickles at the side or even almost obsolete; rachis trigonous, bifaced and smooth above, armed beneath with a few scattered, rather strong and sometimes long-tipped claws; these more numerous towards the apex; leaflets few, grouped into 3–5 subopposite, 5–10 cm. apart, fascicles of 3–4 (the fascicles formed by two very approximate leaflets on each side of the rachis), lanceolate-elliptic or oblong-lanceolate, suddenly acuminate at the apex, gradually attenuate at the base, where callous at the insertion, papyraceous, rigidulous, glabrous, slightly paler beneath than above, spreading or radiately divaricate, 3-costulate or with the mid-costa acute accompanied on each side with a secondary nerve stronger than the others; all nerves and costae smooth on both surfaces; transverse veinlets very minute, crowded and much interrupted; the largest leaflets, the mesial, 15–20 cm. long, 2·5 cm. broad, the 4 of the terminal group approximate and almost digitate, somewhat shorter and broader than the others and more distinctly bristly-penicillate at the apex; the two of the terminal pair connate up to the middle. *Male spadix* ultradecompound, slender, longer than the leaves, arched, inserted with a distinct tumescent callus near the mouth of the sheath; primary spathes tubular, very narrow, closely sheathing, the lowest slightly compressed, two-keeled, the keels spinulous; the upper one cylindraceous, aculeolate; partial inflorescences short, the lowest in one specimen 10 cm. long, rather lax, arched, with a few spreading branches, of which the lowest a good deal longer than the upper ones; spikelets slender, their axis filiform; the lower ones, the largest, 10–12 mm. long with 4–6 rather remote flowers on each side; spathels cylindraceous at the base, suddenly expanded into a rather broad infundibuliform striately veined limb, which is prolonged at one side into an acuminate point; involucre subbracteiform, slightly concave, trilobate, the lobes striately veined, acute. *Male flowers* small, 3 mm. long, ovate, acute; the calyx flat and subcallous at the base, strongly striately veined, divided down to about the middle into 3 triangular acute lobes; corolla (in full-grown flowers) about twice as long as the calyx; the segments finely striolate outside, narrowed and apiculate at the apex. *Female spadix* simply decompound, elongate, ending in a long slender clawed flagellum; primary spathes closely sheathing; the lowest faintly two-keeled, glabrous, smooth or feebly armed on the keels with very few small aculei, very obliquely truncate and acute on one side at the mouth; partial inflorescences few (3–4) not very large, about 15 cm. long, strongly arched, inserted inside the mouth of their respective spathes; the largest on each side with 6–7 distichous, alternate, rather distant spikelets which decrease in length from the base of the inflorescence upwards; secondary spathes tubular, slightly enlarged above, obliquely truncate and acute on one side at the mouth; spikelets attached just at or a little above the mouth of their own spathes, conspicuously callous at their upper axilla, spreading and arched downwards, slender, the lower ones, the largest, 4–5 cm. long, with 5–6 remote distichous flowers on each side; the upper ones 15–20 mm. long and with very few flowers; spathels tubular at the base, rather suddenly broadened into an obliquely infundibuliform limb, this truncate, entire, ciliolate at the mouth and apiculate at one side; involucrophorum laterally attached outside its own spathel at the base of the one above, more or less distinctly pedicellate, callous at the axilla next to the axis, with a shallowly concave limb; involucre larger and exceeding the involucrophorum, shallowly cupular or almost flat with a large central scar and an irregularly circular limb; areola of the neuter flower very depressed, linear, with a punctiform scar in the centre. *Female flowers* small, about 3 mm. long. *Fruiting perianth* distinctly pedicelliform; the calyx flat at the base, the tube cylindraceous, the teeth not distinctly veined, broadly triangular, acute; segments of the corolla slightly longer than the lobes of the calyx and narrower than these. *Fruit* globose, topped by a very small conic acute beak, 8–10 mm. in diam.; scales in 21–23 series, faintly and narrowly channelled along the middle, subshining, light-yellowish with a reddish-brown rather acute tip; margins indistinctly erosely toothed. *Seed* irregularly globose, 6 mm. in diam., coarsely tubercled and grooved or broadly pitted on the back, with a round and deep chalazal fovea in the centre of the raphal side; albumen subhomogeneous, some of the pits sometimes penetrating into its mass; embryo basal.

Habitat.—Hong-Kong: where it was discovered in fruit in March 1875 by Dr. G. Dods in the valley of Wongneichung, *Hance* No. 18979 in St. Petersb. Herb.; it was found again in that Island also in fruit by *C. Ford* in 1882 (Herb. Kew); in Hainan, *Henry* No. 8213 in Herb. Berol. (male specimen).

Observations.—A species very distinct by the conspicuously fascicled arrangement of its few oblong-lanceolate leaflets; its small dimensions; the small round fruit with pedicelliform perianth, propped up by a subpedicelliform involucrophorum.

I have described the male spadix from Henry's specimen, which seems to me to agree perfectly with Hance's and Ford's typical fruiting specimens.

Plate 104.—Calamus tetradactylus *Hance.*—Fig. *A*, spikelet with a fruit, enlarged 3 times; *B*, portion of a fruit spadix; *C*, summit of the leaf represented in the following plate.

Plate 104 A.—Calamus tetradactylus *Hance.*—The apical portion of a plant wit a leaf, the summit of which is represented in the preceding plate.

87. Calamus acanthospathus Griff. in Calc. Journ. Nat. Hist. v, 39, and Palms Brit. Ind. 50, pl. cxc b. (excl. pl. cxc a f. 1 which belongs to *C. erectus*); Mart. Hist. Nat. Palm. iii, 333; Walp. Ann. iii, 484 and v, 830; Hook. f. Fl. Brit. Ind. vi, 448; Becc. in Rec. Bot. Surv. Ind. ii, 206.

C. montanus T. And. in Journ. Linn. Soc. xi, (1869), 7; F. v. Muell. Select Extra-trop. Pl., 69; Gamble. Man. Ind. Timb., 424.

Description.—Suberect with an elongate stem or subscandent (?), rather large and robust. *Sheathed stem* 3–5 cm. in diam.; naked canes 2–2·5 cm. in diam. with relatively short internodes (about 15 cm. long). *Leaf-sheaths* thickly coriaceous or almost woody, cylindraceous, rather short, gibbous above, obliquely truncate and naked at the mouth, entirely covered, chiefly in their upper part, with small very short and broad-based spines, which are very approximate, solitary or subseriately confluent and are often reduced to small pungent tubercles or sometimes have a more or less elongate acicular point. *Ocrea* very short, liguliform, axillary, triangular, exsuccous, glabrous. *Leaves* large, up to 1·5 m. long, not cirriferous; petiole (of the upper part of the adult plant) 8–10 cm. long or almost obsolete; and, like the first portion of the rachis, robust, up to 1·5–2 cm. in width, flattish above where more or less covered with small scattered very short (1–3 mm. long) spines, its margins subobtuse, more or less armed with small straight spines, convex and smooth beneath; the rachis in the intermediate portion rigid, robust, obsoletely angulate and furnished here and there with a few prickles; in the upper portion trigonous, acutely bifaced and smooth above and more or less partially armed beneath at a distance of 3–4 cm. with black-tipped and stout claws; leaflets relatively not very numerous, inequidistant, solitary, not grouped and never in pairs on a side, the lower ones usually opposite or nearly so; the pairs 8–10 cm. apart, from the middle upwards alternate and less distant than the lower ones; 3–5 approximate at the summit; the two of the terminal pair quite free at the base, somewhat shorter than the other; all more or less narrowly lanceolate-elliptic, almost equally narrowed to both ends, acute and many-plicate at the base, gradually acuminate at the summit into a bristly-penicillate tip, concolorous and green on both surfaces even when dry, papyraceous, rather thin in texture, usually with six, more rarely 5–7 acute but rather slender costae, the mid-costa slightly the strongest and not quite central, all sprinkled with a few short bristly spinules or quite smooth; beneath all nerves fainter and naked; transverse veinlets very sharp; margins finely ciliate at the summit, otherwise very minutely spinulous or almost smooth; the largest leaflets, the intermediate ones, up to 45 cm. long and 5–6 cm. broad in vigorous specimens, but usually 25–30 cm. by 4–5 cm. *Male spadix* ultradecompound, attached laterally near the mouth of the sheath with a more or less distinct callus, very long (3 m. and even more), rigid, erect and stout in its basal portion, slender flagelliform and nodding upwards, terminating in a very long thong; this loosely sheathed with tubular flattened often split spathes which are smooth or very scantily armed with small scattered claws; primary spathes elongate, tubular, terminating in an acutely carinate triangular point, the lowest thickly coriaceous, somewhat flattened, with the edges acute and armed with straight horizontal short spines, otherwise smooth, its apex triangular and acutely keeled on the back; the upper spathes more cylindraceous, somewhat enlarged above, usually split longitudinally on the inner side, smooth or sparingly prickly and with a broad triangular apex; partial inflorescences relatively to the length of the spadix few (5–6), attached inside the mouth of their own spathes, gradually smaller from the base of the spadix upwards, the lowest 50-60 cm. in length, forming large loose pyramidate-cupressiform panicles with numerous branchlets or compound spikelets in their lower portion and simple spikelets towards the summit, which terminates in a spikelet longer than the side ones; secondary spathes tubular-infundibuliform, rather short, unarmed, obliquely truncate, naked and entire at the mouth, prolonged at one side into a triangular distinctly apiculate point; the branchlets and spikelets inserted at or above the mouth of the spathes with a distinct axillary callus; lower branchlets elongate with many rudimentary or few-flowered spikelets at their base; spikelets of very unequal length, 6–7 cm. long at most, and with 8–10 rather remote, horizontally inserted flowers on each side; spathels with a suddenly expanded bracteiform, broad, concave, patent or deflexed limb; involucre laterally attached to the axis of the spikelet between two spathels, shortly but neatly cupular, truncate, obsoletely 2-toothed next to the axis; in the lower part many of the spikelets subpedicelliform representing rudimentary branchlets. *Male flowers* ovate (when young); the calyx strongly striately veined. *Female spadix* decompound or partly ultradecompound, rather rigid, 1·3–2 m. long, more or less distinctly flagelliferous at its summit and with many partial inflorescences; primary spathes tubular, closely sheathing; the lowest about 20 cm. long, rather thickly coriaceous, somewhat flattened, usually armed on the rather acute edges, chiefly near the base, with pectinate spines and on the faces, especially in the upper part, with short conic spines; the upper primary spathes cylindraceous, slightly enlarged above, more or less split longitudinally, prolonged at one side into a short triangular acute point, attenuate but rather stout and subcylindraceous or somewhat compressed at the base, where not rarely clawed on the back, otherwise smooth or slightly armed; partial inflorescences relatively short and dense, rigid, panicled, rather remotely inserted near the mouth of their own spathe, at first ascendent, then arched, decreasing in size from the base of the spadix upwards; the largest, the lowest, sometimes slightly decompound or with their lowest spikelets branched; in vigorous specimens 20–30 cm. long and with 5–6 spikelets on each side and with a spikelet larger than the side ones at their summit; secondary spathes tubular-infundibuliform, very closely sheathing, rather short, nicely truncate and entire at the mouth and shortly apiculate at one side; spikelets attached above the mouth of their own spathe, slightly callous at the axilla and with a distinct transverse rima, spreading, arched, rigid, rather stout and relatively short; the larger ones, the lowest, 5–7 cm. long with 10–14 flowers in all, these not exactly on one plane but somewhat subunilaterally arranged in two collateral series and turned upwards; spathels shortly tubular-infundibuliform, truncate, entire and acute at one side; involucrophorum exsert from its own spathel and laterally attached to the base of the one above, shallowly cupular with a small axillary callus and a transverse rima next to the axis; involucre regularly cupular with entire truncate margin; areola of the neuter flower superficial, often obsolete and marked by a small punctiform scar. *Female flowers* ovate, rather distant, 5–6 mm. apart, rather large (5 mm. long); the calyx campanulate, obsoletely veined, its teeth superficial, very broad, acute; corolla divided down almost to the middle into 3 ovate-acute faintly veined segments, which are a good deal narrower than the lobes of the calyx and about as long; stamens with the filaments united by their bases as high as the undivided portion of the corolla and forming a cup, then suddenly subulate. *Fruiting perianth* pedicelliform, thick and short (3–3·5 mm. long). *Fruit* broadly ovoid, suddenly narrowed at the summit into a small conic beak, caudiculate at the base, 24–25 mm. long, including the beak and the perianth, 14-15 mm. in diam.; the scales of an uniform cinnamon-brown colour, in 15 series, rhomboid, about as long as broad, superficially but distinctly channelled along the middle, almost shining but under the lens very minutely scabridulous; the tip rather obtuse and ciliately fringed, the margins finely ciliolate. *Seed* ovoid-oblong, rounded at both ends, convex and very deeply pitted on the back, flattish and with a deeply penetrating elliptic chalazal fovea on the raphal side; albumen subruminate or with rather deep intrusions of the integument of the seed; embryo basal.

HABITAT.—Khasia Hills, between 700–1300 metr., *Griffith* in Herb. Kew; at Nowgong, and at Churra, *Hooker & Thomson*; Sikkim Himalaya up to 2,000 m., *Hooker f.*, *Gamble*, *Prain;* Bhutan, *Gamble*; Eastern Nepal, 1,600 m., *Hooker f.* in Herb. Kew.—Native names; "Gouri-beṭ" (Nepal), "Rue" or "Rhu" (Lepchas).

OBSERVATIONS.—This seems very variable in size and in the armature of the sheaths and spathes. I have described the male plant from a large Sikkim specimen kindly sent to me by Lieut.-Colonel Prain, and consisting of the upper portion of an entire plant, with the leaves forming a large crown as in some species of *Pinanga*; the sheaths are 5 cm. in diam. and are all without flagella, every one bearing a spadix. This specimen was certainly not scandent. The sheaths are covered with small tubercles; the petiole is 2 cm. in width, and the entire leaf measures 1·5 m. in length and the spadices more than 3 metres; the spathes are almost unarmed. The fruiting specimens of the Calcutta Herbarium have the sheaths armed with better conformed spines, of which some have straight acicular points; the spathes also are much more densely prickly than in the Sikkim specimen mentioned above. *C. montanus* T. And., of which I have seen the fruit in the Herbarium at Kew, seems to me exactly the same species as *C. acanthospathus.*

The adult plant seems devoid of leaf-sheath flagella, but these may be present in its juvenile period.

The chief characteristics of *C. acanthospathus* are its non-scandent suberect habit; the short tubercled spinous leaf-sheaths; the large leaves with large many-costate and plicate lanceolate inequidistant remote leaflets, which are always solitary and never paired on each side of the rachis; the very long spadices, the female inflorescences with subscorpioid spikelets where the flowers are in two collateral series and somewhat unilateral; the fruit with scales of an uniform cinnamon-brown colour, subshining and channelled along the middle.—Allied to the following.

PLATE 105.—Calamus acanthospathus *Griff.* Upper portion of a leaf-sheath with the base of a spadix; lower portion of a spadix with mature fruit; terminal portion of a female spadix with ovaries in course of development; two leaflets as seen from the lower surface; one leaflet from the upper surface; two seeds, one showing the back and the other the raphal side; one seed longitudinally cut through the embryo.—(All figures from a specimen in the Calcutta Herb.).

88. CALAMUS FEANUS Becc. in Hook. f. Fl. Brit. Ind. vi, 448, and in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* 16–22 cm. in diam.; canes 1 cm. thick, with rather short internodes. *Leaf-sheaths* cylindraceous, rather thick and almost woody, distinctly marbled with dark-green and lighter furfuraceous spots, rather powerfully armed with solitary and scattered stout subdimidiate-conic spines, which are broad at the base, where further they are rather swollen above and flat or slightly convex beneath, horizontal or deflexed, 6–12 mm. long, leaving an elongate triangular impression above them and accompanied by very short and tuberculiform prickles. *Ocrea* very short, truncate, entire, glabrous, spinulous. *Leaf-sheath flagella* very long, callous at their insertion, flattened and with prickly very acute edges in their lower portion, irregularly armed upwards with solitary or 2–3 nate rather robust claws, which have a swollen light base and a black tip. *Leaves* not cirriferous, about 1 m. in length; petiole very short, 3–7 cm. long (or almost obsolete), flat and smooth or with a spinule here and there above, armed at the sides as in the first portion of the rachis with short straight or slightly curved spines, convex beneath, where also, as on the rachis, armed along the middle with solitary stout claws; upper part of the rachis bifaced and smooth above; leaflets few (6–8 on each side), inequidistant but not fascicled, rather remote, alternate or sub-opposite, rigidulously papyraceous, dark-green when dry, somewhat convex, glabrous, almost concolorous, elliptic-lanceolate or oblanceolate, attached to the rachis by a narrow and many-plicate base, suddenly narrowed at the summit into a rather short penicillate point, which is longer and more gradually acuminate in the lower leaflets, furnished with 7–9 primary nerves or costae, which are rather slender, all of about the same strength and almost equally raised on both surfaces, inconspicuously and very sparingly spinulous above, naked beneath; the mid-costa usually non-central and scarcely stronger than the others; transverse veinlets rather distinct and approximate; margins closely ciliate with spreading spinules, these shorter, appressed and more distant towards the base; the largest leaflets, those of the lower third-part of the rachis, 20–32 cm. in length and 5–7 cm. in width; those near the base narrower; the upper ones shorter (16–20 cm.); the leaf usually terminated by two leaflets perfectly free at the base and accompanied by a smaller or rudimentary leaflet between them; in other cases this terminal leaflet is fully developed and not different from the two next. *Male spadix* . . . . . *Female spadix* decompound, elongate-flagelliform (1·5 m. long) erect, rather rigid, with many (7 in one specimen) partial inflorescences; primary spathes tubular, elongate, closely sheathing, coriaceous, green, glabrous, finely longi, tudinally striate, the lowest about 20 cm. long, truncate and entire at the mouth-somewhat flattened with the edges acute and armed with short strong prickles, of which some are also scattered on the faces; the upper primary spathes cylindraceous, somewhat enlarged above, but always strictly sheathing, clawed on the back, chiefly at the base, which is narrow subterete or slightly compressed with very obtuse angles (not as usual flat on the inner side), the mouth truncate or very shortly split and prolonged on one side into a very short triangular point; partial inflorescences short, rigid, panicled, subscorpioid, rather remotely inserted at or a little above the mouth of their own spathe, at first ascendent, then strongly arched downwards, decreasing in size from the base of the spadix upwards: the largest ones, the lowest, 10–14 cm. long with 3–4 spikelets on each side and with a terminal one longer than the side ones; secondary spathes tubular-infundibuliform, very closely sheathing, rather short, smooth, exactly truncate and entire at the mouth and shortly apiculate at one side; spikelets spreading, strongly arched downwards, inserted above the mouth of their own spathes slightly callous at their axilla, rigid, rather stout and short: the larger ones, the lowest, 3–5 cm. long with 10–12 flowers in all, these not in one plane but subunilateral and arranged in two collateral series, and turned upwards; spathels shortly tubular-infundibuliform, truncate, entire and acute at one side; involucrophorum exsert from its own spathel and laterally attached to the base of the one above, very shallowly cupular or subdiscoid with an inconspicuous axillary callus next to the axis; involucre regularly cupular, rather deep, with entire truncate margin; areola of the neuter flower sublunate obtusely bordered. *Female flowers* ovate, rather distant

(5–6 mm. apart), rather large (5 mm. long); the calyx campanulate, obsoletely veined, its teeth superficial, very broad, acute; the corolla divided down almost to the middle into 3 ovate acute, faintly striate segments, these narrower a good deal than the lobes of the calyx and about as long; stamens united by their bases as high as the undivided portion of the corolla and forming a cup which is crowned by the suddenly subulate filaments. *Fruiting perianth* pedicelliform, short and thick. *Fruit* broadly ovoid, suddenly contracted into a short conic acute beak and crowned by the very small recurved stigmas, 17–18 mm. long, including the beak, 12 mm. in diam.; scales reddish-brown or of a cinnamon colour in 15 series, about as long as wide, slightly convex, not channelled along the middle, opaque and as if pulverulent, with a broad rather discoloured, more polished band; the apex rather obtuse, distinctly ciliately fringed; the margins also ciliately fringed at first, later finely toothed. *Seed* oblong, rounded to both ends, 9–10 mm. long, 6 mm. thick, irregularly and deeply grooved on the back with a deeply penetrating elliptic chalazal fovea on the centre of the raphal side; albumen subruminate, viz., with superficial intrusion of the integument of the seed; embryo basal.

HABITAT.—Discovered by Sig. Leonardo Fea during his important and fruitful zoological explorations in February 1887, at 1200–1400 m. above the level of the sea, on the west side of the Moolyet range in Tenasserim.

OBSERVATIONS.—Evidently related to *C. acanthospathus*, but very distinct by its smaller dimensions, the armature of the leaf-sheaths and the fruit with opaque not channelled scales.

PLATE 106.—Calamus Feanus *Becc.* Portion of the sheathed stem with an entire spadix; another ☿ spadix with almost mature fruit; the summit of a leaf (under-surface); detached fruits and seeds.—From Sig. Fea's specimen in H. Becc.

89. CALAMUS BACULARIS Becc. Nelle Foreste di Borneo, 609, and in Rec. Bot. Surv. Ind. ii, 206.

DESCRIPTION.—Not scandent. *Stem* erect, 2 m. high, as thick as a common walking cane. *Leaf-sheaths* not cirriferous, gradually passing into the petiole, open above on the ventral side where densely armed near the mouth with very long (4–5 cm.), dark, opaque, rather thickly laminar, rigid, erect spines; in the remaining portion of the spathe the spines are smaller and on the ventral side interruptedly seriate. *Leaves* not cirriferous, large, about 2 m. long; petiole very long, in one specimen 70 cm. in length, subterete near the base, obsoletely angular, and smooth in its upper part, strongly armed from the base to about the middle with strong, narrowly laminar, rigid, horizontal spines, of which the lowest are as much as 3 cm. long and, especially on the back, often geminate or ternate and divergent; the upper ones gradually diminishing in length; rachis quite smooth on both surfaces, acutely bifaced above, roundish lower down and flat upwards beneath; leaflets numerous, equidistant, very regularly inserted at an angle of 45°, 18–20 mm. apart, linear-lanceolate, almost equally narrowed to both ends, very acuminate at the apex into a filamentous tip, this with short bristles at the sides, concolorous, glabrous and subshining on both surfaces, quite naked and smooth beneath and with 3 acute costae which are spinulous above (the mid-costa less spinulous than the side ones); margins smooth (not bristly or spinulous), with a slender secondary nerve running alongside; transverse veinlets sharp, approximate; the largest leaflets, those near the base, 28–30 cm. long, 22 mm. broad; the upper ones somewhat smaller, narrower and less acute and with a small brush of short and black bristles at the apex; the two of the terminal pair linear, very narrow, free at the base. *Male spadix* (in one specimen) erect, not flagelliferous at the summit, about 1 m. in length, partially ultradecompound, quite unarmed in every part, with a peduncular part (sheathed by a spathe) 25 cm. long, with 6 approximate partial inflorescences; lowest primary spathes strongly flattened, closely sheathing, acutely two-edged and with a lanceolate limb at their summit; upper primary spathes tubular, slightly flattened, somewhat enlarged and rather loosely sheathing above, narrowed a good deal at the base, greenish when dry, fugaciously furfuraceous, and with an exsuccous, auriculiform lanceolate acuminate limb at their summit which occasionally is furnished with a few subspinous (deciduous?) paleolae on the apex; the lowest partial inflorescence, the largest, decompound or divided into various slender branchlets (6–10 cm. long), each with numerous very short (3–5 mm.) arched or recurved spikelets, which have only 2–5 flowers on each side; the upper inflorescences have 4–5 spikelets on each side; these 2–3 cm. long with 8–12 perfectly bifarious flowers on each side; secondary spathes infundibuliform, furfuraceous, truncate and densely ciliate-bearded at the mouth, prolonged at one side into a hairy-penicillate point; spathels closely packed, bracteiform, deflexed, concave, broadly ovate, acute, strongly striately veined; involucre calyculiform and apparently formed by two broadly ovate, acute, strongly striately veined bracts which are connate by their base and adnate laterally to the axis of the spikelet. *Male flowers* cylindraceous, narrow, acute, 4 mm. long and 1·5 mm. thick; the calyx cylindraceous, obsoletely veined with 3 short broadly triangular acute teeth; the corolla more than twice as long as the calyx, its segments linear, polished outside. *Female spadix* simply decompound, with an elongate unarmed tail-like appendix at its summit; primary spathes as in the male spadix and provided with a few subspinous hairs at the summit; partial inflorescences with rather many bifarious spikelets; secondary spathes 12–15 mm. long in the exposed part, tubular-infundibuliform and with a triangular horizontal or deflexed point; spikelets rigid, deflexed, inserted just at the mouth of their respective spathes, with a distinct axillary callus, 6–7 cm. long, with 10–12 flowers on each side; spathels very short with a deflexed triangular point; involucrophorum shallow, laterally attached outside its own spathel at the base of the one above; involucre shallow, 2–3-lobed, strongly veined; areola of the neuter flower very depressedly lunate, sharply bordered. *Female flowers* elongate-conic, 4 mm. long; the calyx flat at the base, strongly veined, divided down almost to the middle into 3 triangular acute teeth; the corolla not quite twice as long as the calyx, its segments lanceolate-acute, polished outside; ovary during anthesis columnar, with a very thick style crowned by triangular recurved stigmas. *Fruiting perianth* explanate. *Fruit* sphaeric, 1 cm. in diam., topped by a very narrow, 2 mm. long, cylindraceous beak; scales in 15 series, very faintly channelled along the middle, shining, spadiceous, with a darker triangular point.—The leaves in herbarium specimens acquire a dark-brown colour.

HABITAT.—Borneo: on mount Mattang, near Kuching in Sarawak, *Beccari* P. B. No. 1933 (male specimen).—Malay name "Rotang Champaka." Used to make walking-sticks. The ♀ plant found by *Dr. Haviland* also in Sarawak (No. 437 in Herb. Kew.)

OBSERVATIONS.—Apparently related to *C. ramosissimus* and *perakenis*, but the spathes are tubular and not open flat.

I have described the female spadix from a specimen preserved at Kew and collected by Dr. Haviland in Sarawak, which has only a portion of a partial inflorescence with flowers during the anthesis. To this specimen is joined a single detached fruit, which, however, I have described as that of this species on account of its peculiar perfectly cylindraceous mucro resting on the top of the sphaeric fruit; this mucro exactly corresponding to the columnar style of the flowers in the said specimen. The characteristics of *C. bacularis* are:—the erect stem; the leaf-sheaths armed with long spines, open on the ventral side and gradually passing into the petiole, this long and armed at the base with long horizontal spines; the leaflets equidistant, narrowly lanceolate, shining, 3-costate; the spadices erect, unarmed, the spathes tubular; male flowers narrow and elongate.

PLATE 107.—Calamus bacularis *Becc.* Upper part of a leaf-sheath with the base of a leaf; an intermediate portion (under-surface) and the terminal part (upper surface) of a leaf; male spadix.—From Beccari P. B. No. 1933.

90. CALAMUS PERAKENSIS Becc. in Hook. f. Fl. Brit. Ind. vi, 451, and in Rec. Bot. Surv. Ind. ii, 207.

DESCRIPTION.—Not scandent, with a very short erect stem. *Leaf-sheaths* not flagelliferous, open longitudinally on the ventral side, 2·5 cm. in diam., passing gradually into the petiole, rather densely armed, chiefly on the back, with solitary spreading ascendent or slightly deflexed, rigid, elastic, narrow, subulate, reddish brown, polished, 1–2 cm. long spines; near the margins and mainly near the mouth at the base of the petiole the spines are longer, some of them attaining the length of 6–7 cm. *Ocrea* inconspicuous (or soon deciduous?). *Leaves* not cirriferous, rather large, 1–1·3 m. in length; petiole rather long (30–35 cm.), robust and rigid, in its upper surface smooth, channelled near the base and flattish or slightly convex upwards; the margins obtuse, very powerfully armed, chiefly near the base, with approximate horizontal elastic subulate straight long spines, which have a base swollen above and sometimes are even 6–7 cm. in length and are often intermingled with small straight prickles; the lower surface of the petiole is round and very closely armed along the middle with a series of small solitary claws; the rachis on its upper surface, near the base, is channelled at the sides and bifaced and smooth upwards; the under-surface is round in its lower portion, where armed with 3 lines of small approximate solitary claws, and is flattish upwards where the claws are confined to along the middle; leaflets very numerous, equidistant, and very regularly set at a wide angle, 2·5 cm. apart or less in smaller specimens, rather rigid, papyraceous, almost shining on both surfaces, slightly paler beneath, ensiform, lanceolate-ensiform or even narrowly lanceolate, slightly narrowed to the base, where suddenly plicate, gradually long-acuminate at the summit into a setaceous and bristly ciliate apex, acutely tricostate, the mid-costa slightly stronger than the side ones, the three bristly-spinulous above, beneath the central costa very finely and closely, and the side ones more sparingly spinulous; margins rather closely ciliate with erecto-patent spinules; transverse veinlets rather sharp, numerous, much interrupted; the largest leaflets in vigorous specimens 30 cm. long, 17–18 mm. broad, but sometimes only 10 cm. long and 1 cm. broad; the upper ones suddenly shorter; the two of the terminal pair quite free at the base. *Male spadix* erect, rather rigid, 0·6 to 1·3 m. long, with 3–4 partial inflorescences partially ultradecompound, with an elongate flattened plano-convex acutely two-edged peduncle, the edges spinulous or unarmed; it terminates in a partial inflorescence or in the more robust specimens in a slender, flattened, unarmed, more or less elongate, tail-like appendix; primary spathes rather closely sheathing in their lower portion, bursting longitudinally upwards and prolonged into a reddish-brown, finely striate, unarmed, rigid, papyraceous, linear-lanceolate, long-acuminate limb which is almost polished inside, opaque and more or less scaly-furfuraceous outside, longer than its own inflorescence or even one-third or one-half shorter and explanate in the lower spathes and auriculiform in the upper ones; the lowest primary spathe has a closely sheathing, strongly flattened, plano-convex, acutely two-edged basilar part, which is a good deal longer in the upper ones; the edges smooth or armed with slender needle-like ascendent spines and the back prickly or smooth; partial inflorescences laxly panicled, erect, very conspicuously callous at their insertion, with a straight rigid axis, the larger 30 cm. long with 3–4 branchlets or compound spikelets on each side in its lowest part and some simple distichous spikelets upwards; the branchlets and the spikelets also with a very large axillary callus; the lowest branchlets, the largest, 8–10 cm. long with 10–12 gradually diminishing spikelets on each side; axial portions between two partial inflorescences straight, rigid, obsoletely angular or somewhat flattened, smooth or more or less furnished with small claws on the outer side; secondary spathes membranous, exsuccous, smooth, tubular-infundibuliform, sheathing only a portion of the axis, entire and obliquely truncate at the mouth, prolonged at one side into an acuminate patent point; simple spikelets rather thick, horizontally inserted with a distinct axillary callus, the largest, the lowest ones, about 2 cm. long with 6–8 flowers on each side; those of the summit very few-flowered; spathels very closely packed, concave-bracteiform with a broadly triangular patent or deflexed acute point; involucre subtended by its spathel, more or less irregularly cupular, rather deep, entire or obsoletely bidentate on the side next to the axis. *Male flowers* elongate, cylindraceous, more or less narrowed at the summit, 4·5–5 mm. long, 1·5 mm. thick; the calyx cylindraceous, flat at the base, obsoletely striately veined, its teeth short, broadly triangular; corolla twice as long as the calyx; the segments narrowly lanceolate-acuminate, shining. *Female spadix* like the male but simply decompound; partial inflorescences few (3–4), attached to the axis with a very conspicuous callus and a transverse rima, erecto-patent, with a rigid and rather thick slightly sinuous axis, which is more or less marked by the impressions of the flowers when in the bud, the largest ones 15–20 cm. long with 5–6 spikelets on each side; secondary spathes as in the male spadix, but sometimes with the point more prolonged and exsuccous; spikelets rather stout, kept horizontal by the pressure of a conspicuous axillary callus; the lowest, the largest, 3–4 cm. long, with 8–10 flowers on each side, those of the summit very short and very few-flowered; spathes very closely packed, densely hairy-furfuraceous, bracteiform, concave, with the point acute and pushed down by its flower; involucrophorum subtended by its own spathel, and attached at the base of the one above with a conspicuous swollen callus at its axilla, shallowly calyculiform, slightly prolonged on the side of the neuter flower; involucre calyculiform, slightly concave, undulate at the margin; areola of the neuter flower obsoletely lunate with a distinct punctiform scar. *Female flowers* pectinate or perfectly bifarious, almost horizontally inserted, not in contact with one another, ovate-conic, 4 mm. long, stout; the calyx somewhat callous, swollen at the base, obsoletely veined, with 3 short acute convergent teeth; the corolla with lanceolate acute segments, very slightly longer than the calyx. *Fruiting perianth* not pedicelliform. *Fruit* (not seen mature) with mahogany-red scales; *seed* . . . . . . albumen . . . . . ; embryo . . . . . —The young parts of the spadix, the spathes, spathels and involucres are rather densely covered with a removable, partly greyish or silvery, and partly rusty scurf. The leaves acquire a brown, and the spathes a reddish-cinnamon colour in herbarium specimens.

HABITAT.—The Malay Peninsula: in the district of Perak, *Scortechini* No. 317*b*; and Bukit Hitam in the State of Selangore, *H. N. Ridley* No. 3839 in Herb. Calc. and Herb. Becc.

OBSERVATIONS.—The distinctive characters of this species are the leaves with a long petiole, which is armed at the sides with very long horizontal spines, and the numerous equidistant narrowly lanceolate 3-costate leaflets; the straight, not flagelliferous, spadices with primary spathes tubular at the base, bursting upwards and more or less expanded into an elongate, lanceolate, acuminate blade. The nearest ally appears to be *C. ramosissimus*.

PLATE 108.—Calamus perakensis *Becc.* Male spadix (on the right hand of the plate); an entire female spadix; the summit of a leaf (upper surface); an intermediate portion of a leaf (lower surface). From Scortechini's specimens, No. 317*b* in Herb. Becc.

91. **CALAMUS RAMOSISSIMUS** Griff. in Calc. Journ. Nat. Hist. v, 78, and Palms Brit. India, 87, t. CCVII; Walp. Ann. v, 828; H. Wendl. in Kerch. Les Palm. 237; Hook. f. Fl. Brit. Ind. vi, 450; Becc. in Rec. Bot. Surv. Ind. ii, 207;

Daemonorops ramosissimus. Mart. Hist. Nat. Palm. iii, 330; Miq. Fl. Ind. Bat. iii, 100; Walp. Ann. iii, 479.

DESCRIPTION.—Tufted, erect, with the stem short (Scortechini) or from 2 to 5 m. high and 6–7 cm. in diam. with the sheaths on (King's collector); other specimens are noted with stem 6–7 m. high and 4 cm. in diam. (King's collector), and subscandent by means of the hooked spines of the leaf-rachis, the plant wanting the leaf-sheath flagella or any other clawed appendix. *Leaf-sheaths* not gibbous above, gradually passing into the petiole, thickly coriaceous, densely armed with straight spines of very variable size, of which some occasionally very short, especially those on the back below the insertion of the petiole, and others, by far more numerous, flat, narrow, subulate, elastic, 1–3 cm. long, somewhat broadened and callous at the base, reddish-brown or spadiceous, spreading, horizontal or slightly deflexed, usually solitary or somewhat confluent into approximate oblique series; the spines on the ventral side and especially those near the mouth a good deal longer than the others, sometimes up to 8–10 cm. in length, erect, very slender and brittle. *Ocrea* very long, up to 15 cm., membranous, exsuccous, chestnut-brown, brittle, not fibrous, ultimately falling to pieces, covered when young with dark-brown furfuraceous removable scurf, unarmed or sometimes spinulous near its base. *Leaves* large, not cirriferous, 2–3 m. long; petiole stout, usually elongate (10–30 cm.), in the lowest part of the upper surface slightly channelled, then flattish, strongly and closely armed at the sides near the base with short or long, straight, robust spines, which have a broad and thick base and are transformed upwards into stout claws, these occasionally accompanied by other small and tuberculiform prickles; underneath the petiole is round, smooth, or even densely armed along the middle with straight semiconic spines, which are transformed upwards into stout reddish-brown dark-tipped, solitary or 2–3-nate claws and extend to the very summit of the rachis; this in the lowest portion of the upper surface broadly channelled at the sides and with an obtuse mesial angle, acutely bifaced upwards; leaflets large and rather numerous (18–20 on each side), rather remote (5–8 cm. apart), subequidistant, never fascicled, often distinctly and somewhat irregularly (mainly towards the summit) opposite; the upper ones with a conspicuous axillary callus and transverse rima, rigid, papyraceous, more or less longitudinally plicate, shining above and very slightly paler beneath, where sometimes (in very young leaves?) covered with a fugacious and easily removable reddish powder, lanceolate, attenuate and acute at the base, gradually but shortly acuminate at the summit into a bristly-spinulous tip, many-nerved or with a not strong mid-costa, acute and smooth in the upper surface, where accompanied on each side by 3–5 rather slender, also quite naked secondary nerves; beneath, the mid-costa slender, smooth or slightly bristly towards the summit and the side-nerves naked and somewhat stronger than on the upper surface; transverse veinlets slender but distinct, crowded and rather continuous across the blade; margins very acute and naked except towards the summit, where they are ciliated with a few spreading approximate short bristles; the largest leaflets, the mesial, 30–40 and, in luxuriant specimens, even 50 cm. in length, 5–6 cm. in width; the upper pairs smaller and more apart; the two of the terminal pair free at the base, but very often the leaf terminates in 3 leaflets of which the mesial is somewhat narrower and slightly shorter than the next ones. *Male spadix* ultra-decompound, not flagelliform, relatively short, rigid, erect, 30–40 cm. and in vigorous specimens even 1 m. in length, with a short, flat, acutely two-edged peduncle; primary spathes very long, at first very narrowly tubular and sheathing the inflorescences, the lower ones covering a good portion of those immediately above, very soon bursting longitudiually, and with the exception of a short basal tubular portion open, flattened into a persistent elongate limb, which is longer a good deal than their respective inflorescences, broadly linear, 15–20 mm. broad, acuminate, thinly coriaceous, exsuccous, unarmed, opaque, finely striate longitudinally and thinly rusty-furfuraceous outside, almost shining and of a cinnamon colour inside; the lowest, flat, sheathing and acutely two-edged at the base, the edge armed with slender, acicular, ascendent spines; the blade about 40–50 cm. long with two acute keels, these spinulous in their lower portion; the upper spathes gradually shorter, but always longer than their respective inflorescences, those of the summit lanceolate, acuminate; the axis of the spadix between two partial inflorescences smooth, irregularly and obsoletely angular aud more or less superficially, often obsoletely pitted from pressure of the flowers in the bud; partial inflorescences panicled, broadly pyramidate, rather dense, the larger ones, the lowest, 15–30 cm. long with many distichous, erecto-patent, gradually diminishing secondary branchlets, of which the lower ones the largest, 8–10 cm. long and with 8–10 spikelets on each side; the axis of the inflorescences and of the branchlets slender but rigid, straight or very slightly sinuous; secondary spathes shortly tubular and more or less prolonged at one side into a membranous acute or acuminate and sometimes lanceolate limb; spikelets erecto-patent, delicate, small, their axis slender, closely zig-zag sinuous, the lower ones, the largest, 2–3 cm. long with 8–10 distichous flowers on each side, those of the summit about 1 cm. long with 3–4 flowers on each side; spathels very approximate, densely hairy-furfuraceous, bracteiform, with a short subobtuse point which is pushed down by its own flower; involucre orbicular, almost explanate-disciform. *Male flowers* distichously inserted at an angle of about 45°, at first ovate-acute, when full grown slender, subterete, 3·5–4 mm. long, the calyx tubular, slightly striately veined, truncate at the base, with 3 broad obtuse or acute lobes, which are often hairy-penicillate at the apex; the corolla twice as long as the calyx, divided down almost to the base into 3 oblong-linear, acute, externally shining segments; filaments shortly connate at the base, subulate, inflected at the apex; anthers linear, narrowly sagittate, rather acute, versatile; the cells discrete to the middle; rudimentary ovary slender, reaching to about the middle of the corolla, formed by a short columnar part which terminates in 3 long subulate points. *Female spadix* simply decompound, erect and rigid, usually shorter than the male ones and with a more robust axial part, rusty-furfuraceous throughout; spathes as in the male spadix; partial inflorescences erect with an axillary callus and a distinct transverse fovea; the lower ones, the largest, 15–17 cm. long with 8–10 spikelets on each side; spikelets rather thick, erecto-patent or when in fruit subhorizontal, 3–5 cm. long with 15–20 very approximate flowers on each side; spathels densely furfuraceous, very short bracteiform, broad, concave, obtuse, deflexed; involucrophorum subtended by its own spathel and attached at the base of the one above, shallow, calyculiform, prolonged into an obtuse deflexed point on the side of the neuter flower; involucre shallow, calyculiform, slightly concave, irregularly lobate, distinctly veined; areola of the neuter flower punctiform. *Female flowers* crowded, inserted at an angle of 45°, ovate-conic, 3 mm, long; the calyx flat and callous at the base, boldly striately veined, its teeth short. broadly triangular, acute, with broad polished margins; the corolla slightly longer than the calyx, its segments acute and polished outside; stamens united by their bases into a thin membranous cup, which is crowned by 6 triangular teeth; anthers sterile, flattened, broadly sagittate and very obtuse; ovary oblong-ovate with a short stout style and thick lamellose recurved stigmas. *Neuter flowers* as long as the female ones, but thinner. *Fruiting perianth* almost explanate, not or very shortly pedicelliform, and with the corolla twice as long as the calyx. *Fruit* broadly ovoid or globose-ovoid, rounded to both ends, topped by a narrow and rather long (2 mm.) beak, 8–10 mm. broad and 13–14 mm. long, including the beak; scales in

15 series (mahogany-red), subconcolorous, rather loosely imbricate, shining, slightly channelled along the middle, tip rather obtuse and, like the margins, erosely toothed. *Seed* ovoid, rounded to both ends, 9 mm. long, 7 mm. broad, 6 mm. thick, with a smooth yellowish-brown surface, convex on the back, and with a deep chalazal fovea in the centre of the raphal side; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula: Malacca, *Griffith;* in the district of Perak at Larut, between 700–1,200 m., Herb. Calc. Nos. 2617, 2910, 6342 and *Scortechini* No. 51^b; Gunong Malacca, between 300–500 m., Herb. Calc. No. 7181; Gunong Ijuk, *Scortechini* No. 1235 in H. Becc.; Maxwell's Hill, 900 m., *Scortechini* No. 416 in Herb. Beccari.

OBSERVATIONS.—I have described the complete specimens gathered by the Revd. Father Scortechini and by Sir G. King's collectors. I have not seen Griffith's authentic specimens; he based the species on a male spadix which had very few flowers and only one terminal spathe left. Nevertheless I entertain no doubt as to the identification. Griffith in the text at p. 85 gives as uncertain the locality of his specimen, but at p. xiii he assigns to it that of Malacca.

Five out of seven leaves that I have examined were terminated by 3 approximate, but quite free leaflets, of which that of the middle one was barely shorter and slightly narrower than the other two; the spathes of *C. ramosissimus* more than those of any other species of the group approach those of some species of *Daemonorops*, as they are longer than the inflorescence, they envelope the lower ones and cover a good portion of the spathes immediately above.

C. ramosissimus is characterised by its suberect habit; the leaves with one terminal entire lanceolate leaflet and the numerous subequidistant lanceolate many-costulate shining concolorous side-leaflets; the rather short spadices with open, flat, long, broadly linear spathes which overlap each other.

PLATE 109.—Calamus ramosissimus *Griff.* An entire male spadix and the terminal portion of a leaf.—From Scortechini's No. 1235 in Herb. Becc.

PLATE 110.—Calamus ramosissimus *Griff.* Leaf-sheath and base of a leaf; portion of the upper part of a leaf; female spadix in flower; an entire fruit-spadix.—From Scortechini's No. 51^b, in Herb. Becc.

92. CALAMUS PASPALANTHUS Becc. in Hook. f. Fl. Brit. Ind. vi, 450, and in Rec. Bot. Surv. Ind. ii, 207.

DESCRIPTION.—Scandent. *Sheathed stem* 2 cm. in diam. *Leaf-sheaths* flagelliferous, very conspicuously inflated-tumescent above at the base of the petiole, almost black when dry, densely armed with large elastic horizontal laminar straight narrowly lanceolate subulate brown-greenish 2–4 cm. long, solitary or slightly confluent and subseriate spines, which are fringed-furfuraceous at the margins in youth and have their base broad, flat beneath, tumescent and light-coloured above; the spines at the mouth of the sheath erect, very slender and acuminate, up to 8–9 cm. long. *Ocrea* very long (up to 20 cm.), speedily dissolved into fine filaments and marcescent.

Leaves not cirriferous, rather large, in one specimen 1·7 m. in length including the petiole; this 45 cm. long, rather robust, 1 cm. thick, deeply and broadly channelled above, rounded and except towards the summit smooth beneath, closely armed on the acute margins with very short straight spines, which are solitary and horizontal upwards, longer, geminate or ternate and pointing in different directions near the base; rachis covered with a permanent woolly-furfuraceous (in youth brown-purplish) indumentum, smooth and except near its base bifaced above, armed on the lower surface with a central series and in its first portion sometimes with 3 series, of small solitary or towards the summit 2–3-fid claws. *Leaf-sheath flagella* very long (in one specimen 2·5 m. in length) with a long flattened and two-edged base, the edges more or less armed with delicate straight ascendent spines, subterete upwards, very closely sheathed by long spathes, these split longitudinally and lacerated in their upper part, and armed with half-whorls of small claws; leaflets very numerous, very regularly and very closely inserted at an angle of 45° (about 15 mm. apart and towards the summit even closer), thin and subherbaceous in texture, narrowly linear, very slightly attenuate to and suddenly plicate at the base, very gradually acuminate into a very slender setaceous tip, this bristly-ciliate at the sides, green even when dry and concolorous on both surfaces, very finely striolate longitudinally beneath, with 3 acute and almost equally strong costae, which are bristly-spinulous above (the mesial only near its summit), less prominent beneath, where the 3 are very minutely and very closely covered with small very fine light cilia; transverse veinlets rather sharp, much interrupted and not very crowded; margins appressedly and minutely spinulous; all leaflets, except those towards the summit which are suddenly shorter, of the same size, 30 cm. long, 8–9 mm. broad; the two of the terminal pair quite free at the base. *Male spadix* very long, flagelliform, ultradecompound with large long and diffuse partial inflorescences, one of these 50 cm. long with some simple spikelets at the summit and with many branchlets in its lower portion; of these branchlets the lower ones up to 20 cm. long and with many (9–10) regularly distichous spikelets on each side; the axis of the branchlets straight and rigid; secondary spathes covered with a rusty-furfuraceous adherent scurf, narrow, closely sheathing, elongate-infundibuliform, unarmed, thin, obliquely truncate at the mouth, where usually split and prolonged at one side into a triangular subscarious lacerate point; spikelets inserted a little inside the mouth of their respective spathes, complanate, very regularly pectinate, the lower ones, the largest, 15–20 mm. long (the upper ones somewhat smaller), with 10–15 perfectly and closely bifarious subhorizontal flowers on each side; spathels very short, very closely packed, bracteiform, concave, very broad, with an acute ascendent point which subtends the involucre; this regularly cupular, deep, with entire truncate margin. *Female spadix* very different from the male one, very elongate and very lax, in one specimen 3·5 m. long including a rather robust flagellum, with 6 very remote partial inflorescences; the flagellum closely armed with half-whorled claws; the peduncular portion excessively long, compressed, flat on the inner side, slightly convex on the back, its margins acute, armed with short irregular prickles; the axial portions between two partial inflorescences very long, subterete or slightly compressed, strongly armed with half-whorls of sharp dark-tipped claws which extend also on the back of the base of the spathes; primary spathes as in the male spadix, lacerated and as long as or longer than their respective inflorescences, the lowest very long, flattened, coalescing with the peduncle in its lowest portion; partial inflorescences kept spreading or almost horizontal by a very large axillary callus (this with a distinct transverse rima) and inserted very far inside their respective spathes, but apparently free from these, which are in their upper part almost destroyed and reduced to filamentous strips, very lax, all of about the same size, 20–25 cm. long with 5–6 spikelets on each side, their axis straight, slender, but rather rigid; secondary spathes narrowly tubular-infundibuliform, membranous, closely sheathing, prolonged at the summit into a long lacerate scarious decayed point, often armed about to their middle on the back with very small claws; spikelets considerably thicker than the axis of the inflorescence, straight or sinuous, horizontal or slightly deflexed, inserted inside the mouth of their respective spathes with a distinct axillary callus, 10–12 cm. long (the upper ones slightly shorter), with 15–20 flowers on each side; spathels infundibuliform, finely striately veined, narrow and gibbous at the base, with thin subscarious often decayed margin; involucrophorum irregularly cupular, half immersed in its own spathel and attached at the base of the one above which is there slightly hollowed to receive it; involucre exactly cupular, rather deep, truncate; areola of the neuter flower very distinct, broadly ovate or suborbicular, callous, very sharply bordered and slightly projecting from the involucres. *Fruiting perianth* explanate, split into 6 almost equal parts. *Fruit* very broadly ovate, mucronulate, about 18 mm. long; scales in 18 series, opaque or only partially subshining, dark reddish-brown, slightly darker near the margins, convex and not channelled along the middle, slightly prolonged into a not fimbriate rather obtuse point. *Seed* very anomalous, flattened, suborbicular in outline, about 1 cm. in diam., with a sharp border, emarginate at the base where slightly thickened and with 2 or 3 more or less distinct conic teeth; the surface smooth but not polished, flat and with a round superficial central chalazal fovea on the raphal side, slightly convex on the back; albumen equable, bony; embryo basal.

HABITAT.—Borneo: on Mt. Mattang near Kuching in Sarawak, *Beccari* P. B. No. 1922, in fruit.—The male plant was also collected by Lobb in Sarawak, according to a specimen preserved in Herb. Kew.

OBSERVATIONS.—After very careful examination I have found some slight differences between the Bornean type-specimens of *C. paspalanthus*, and those of the Malayan Peninsula, which have induced me to consider these last as belonging to a local or geographical variety (see observations on the variety).

The male flowers in Lobb's male specimen are not fully developed; they are ovate, with the calyx superficially urceolate and broadly three-toothed and distinctly striately veined, as also very conspicuously are the spathels and the sides of the involucres, whilst in the fully developed spikelets of the Malayan specimens the flowers are cylindraceous and the spathels not or very indistinctly striate. *C. paspalanthus* is a very remarkable and easily recognizable species by its leaf-sheaths conspicuously swollen in their upper part at the base of the petiole; the numerous equidistant approximate narrowly linear leaflets with 3 acute costae, which are sparsely bristly above and very minutely and closely ciliate beneath; the very elongate spadices with the spathes as long as or longer than their respective inflorescences, tubular at the base and reduced into long strips in their upper part; the male spadix with numerous small pectinate spikelets (like those of some *Panica*); and the female spadix very different from the male one and with long spikelets, and specially by the flat bony seed.

PLATE 112.—Calamus paspalanthus *Becc.* Portion of the upper part of an adult female plant with base of leaves and of a spadix; summit and basal portion of a leaf; female fruit-spadix; two detached seeds, one from the dorsal and the other from the ventral side.—From P. B. No. 1922.

CALAMUS PASPALANTHUS var. PENINSULARIS Becc.

Daemonorops? intumescens Becc. in Rec. Bot. Surv. Ind. ii, 222.

DESCRIPTION.—*Sheathed stem* 2 cm. in diam. *Leaf-sheaths* armed at the mouth with long spreading spines. *Ocrea* marcescent. *Leaves* with the petiole armed near the base with long straight horizontal spines; leaflets up to 40 cm. long and 13–14 mm. broad. *Male spadix* with large and diffuse partial inflorescences; spikelets spreading, 15–20 mm. long, with 10–15 perfectly bifarious flowers on each side; spathels not or indistinctly striately veined. *Male flowers* about 2 mm. long, shining; the calyx broadly cylindraceous, obsoletely or coarsely veined, its teeth very superficial, acute; the corolla twice as long as the calyx. *Female spadix* with spikelets up to 18 cm. long and with 25 flowers on each side; spathels irregularly armed with very small claws. *Fruit* (not seen perfectly ripe) apparently as in the type.

HABITAT.—The Malayan Peninsula: at Goping, *Kunstler* No. 577 in Herb. Calc. Batu Pahut, Patani, in the State of Johore, *Ridley* No. 11209 in Herb. Berol.

OBSERVATIONS.—The No. 577 of the Calcutta Herbarium consists of a male spadix and of a leaf with the upper part of the sheath, but this is too small a portion for a comparison with the corresponding part of the Bornean specimens; the spines at the mouth of the sheaths are long and irregularly spreading; the ocrea is destroyed. The male spadix is exactly like that of the Bornean specimen but bears fully developed flowers, and to this cause no doubt must be attributed the different form of these in the two spadices. I do not know if this same cause may be sufficient to account for the different aspect in the surface of the spathels and of the involucres, for, as I have already pointed out, in the Bornean specimen these organs are boldly striately veined, whilst they are almost smooth in that from Goping. Ridley's No. 11209 has a female spadix with almost mature fruits, which do not seem to me to differ in any way from the Bornean ones, but the spikelets are much longer and (very curiously) have prickly spathels. The leaflets in both specimens are somewhat larger than in the P. B. specimen.

After a careful study I have come to the conclusion that the Palm which in the *Rec. Bot. Surv. Ind.* (l. c.) I have published under the name of *Daemonorops intumescens*, probably belongs to *C. paspalanthus* in a not yet fertile condition, or perhaps in a depauperate form. Should this be true and should the Malayan plant after the inspection of more complete materials prove to be a species distinct from the Bornean *C. paspalanthus*, the name of *C. intumescens* would be an appropriate one for it.

The specimens which I now consider as the young stage or as a form of *C paspalanthus* and which received the name of *D. intumescens* were gathered by Father Scortechini in the State of Perak. I have seen two other specimens very similar to these, sent from Johore to the Berlin Herbarium by H. N. Ridley. Scortechini's specimens have a sheathed stem 10–12 mm. in diam.; the leaf-sheaths are very conspicuously puffed up or inflated-tumescent at the base of the petiole, are almost black, opaque, very finely scabridulous (when dry), sparsely armed with scattered 1–2 cm. long spines; the ocrea is speedily marcescent and vanishing, not fibrous; the leaves with the petiole are armed at the margins near the base with horizontal rather close very slender spines; the leaflets are exactly as in the type but smaller, 15–16 cm. long, 8–9 mm. broad.

PLATE 111.—Calamus paspalanthus VAR. peninsularis *Becc.* An intermediate portion of a leaf (under surface); male spadix. From No. 577 in the Calcutta Herb.

PLATE 113.—Calamus paspalanthus VAR. peninsularis *Becc.* Portion of the stem with an entire leaf of Scortechini's specimen in Herb. Becc.—The type of *Daemonorops ? intumescens* Becc.

93. CALAMUS GURUBA Ham. in Mart. Hist. Nat. Palm. iii (1st edit.) 211 and (2nd edit.) 206 and 330, pl. 175, f. 1. t. z. XVIII, f. XX, XXI; Griff. in Calc. Journ. Nat. Hist. v, 42 and Palms Brit. Ind. 54; Kunth Enum. Pl. iii, 210; Kurz. in Journ. Asiat. Soc. Beng. xliii, 2 (1874), 214 (in cit. Griff. excl. f. 195B) and Forest Fl. Brit. Burma, ii, 522; Gamble Man. Ind. Timb. 424; Hook. f. Fl. Brit. Ind. vi, 449; Becc. in. Rec. Bot. Surv. Ind. ii, 207.

C. Mastersianus Griff. in Calc. Journ. Nat. Hist. v, 76 and Palms Brit. Ind. 84, t. CCVI; Gamble Man. Ind. Timb. 424.

Daemonorops Guruba var. *Hamiltonianus* and var. *Mastersianus* Mart. Hist. Nat. Palm. iii, 206 (edit. 2nd) and 330; Walp. Ann. iii, 479 and v, 828; Miq. Fl. Ind. Bat. iii. 100.

DESCRIPTION.—Scandent, slender or of moderate size. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* gibbous above, armed with light-brown scattered, solitary, flat, elastic, narrowly triangular-lanceolate and subulate spines which are commonly 8–12, but sometimes even 20 mm. long, usually ascendent and obliquely inserted, but occasionally horizontal and less frequently even deflexed, their base broad, concave beneath and decurrent at the sides; amongst these are intermingled many other spines of the same shape but much smaller and sometimes very minute. *Ocrea* in young leaves large, 6–7 cm. long, unarmed, speedily lacerate and deciduous, brown, papyraceous, glabrous, exsuccous. *Leaf-sheath flagella* slender, prickly throughout even in their lower portion. *Leaves* not cirriferous, 60–80 cm., and in very vigorous plants up to 1·3 m. in length; petiole (of the upper part of the adult plant) 12–20 cm. long, flat or slightly channelled above, where usually smooth, but sometimes very sparingly spinulous near the base (occasionally on each side of it near the mouth of the sheath occurs a solitary long straight spine): the margins of the petiole are acute, more or less irregularly armed with short or rather long straight horizontal or ascendent spines, which sometimes extend also to the sides of the rachis, or even almost smooth; on the under-surface the petiole is rounded and usually armed, at least along the middle, with solitary, straight, broad-based, usually rather long (even 2 cm.) and more or less deflexed spines, which not infrequently are changed into claws, especially when passing into the rachis where they gradually become smaller, and extend to its very summit; the spines are usually solitary, and with a relatively long brownish and often very suddenly deflexed point; above, the rachis is acutely bifaced and smooth; leaflets numerous (about 35 on each side), rather closely set, equidistant, alternate or subopposite, thinly papyraceous, opaque or subshining and concolorous on both surfaces, narrowly ensiform, somewhat attenuate at the base, where suddenly plicate, gradually acuminate into a subulate and filamentous tip, more or less distinctly tricostulate, or with the mid-costa (acute and bristly-spinulous near the summit) accompanied on each side by a secondary nerve which is more distinct than the others, and furnished with rather numerous long or short bristles; in the lower surface the mid-costa not very prominent, spinulous, and the side-nerves usually smooth or exceptionally very scantily bristly-spinulous; margins very minutely and appressedly spinulous, transverse veinlets sinuous and often inconspicuous; the largest leaflets in vigorous specimens 30–35 cm. long and 18–20 mm. in width, in smaller plants only 18–20 cm. in length and 15-17 mm. in width, the upper ones proportionately shorter; the two terminal often unequal or united into an entire one, which terminates the leaf. *Male spadix* ultradecompound, flagelliform, up to 2–3 m. in length, including a long slender irregularly clawed apical flagellum, with many (7–8 or even more) remote partial inflorescences; the lowest primary spathe very long (in one specimen 50 cm.), flat, sheathing and acutely two-edged at the base, split longitudinally and more or less open, and dorsally two-keeled and aculeolate upwards, armed on the edges chiefly near the base with straight, short or long (10–15 mm. at most), horizontal or ascendent spines, which become smaller and more distant in its upper part; upper primary spathes very long (30-50 cm.) at first very narrowly tubular and sheathing the inflorescences, but very soon bursting longitudinally on one side and with the exception of the lowest sheathing portion expanded into a persistent elongate flat limb, which is thinly coriaceous and exsuccous in texture, very broadly linear (1–3·5 cm. in width) obtuse, apiculate and obsoletely toothed at the apex, of a cinnamon-brown colour, almost polished inside, finely striately veined longitudinally, usually unarmed outside in their upper part, but not infrequently more or less clawed externally in their basal portion; the claws more numerous and more robust in the slender axial portion between two partial inflorescences; partial inflorescences sub-erect, rather dense, broadly paniculate, considerably shorter than their own spathes, distinctly callous at their insertion, 12–25 cm. long, their axis straight, rigid, slender, obsoletely angular, with 8–10 gradually shorter branchlets on each side; secondary spathes short, very narrow-tubular and sheathing in their lower portion, split longitudinally above at one side and expanded into an auriculiform, exsuccous, membranous, striately veined, acute or acuminate and often split limb, which subtends or embraces the base of the branchlets; secondary branchlets (or compound spikes) regularly distichous, and also gradually decreasing in size, rigid, inserted at an angle of 45° (during the anthesis), strongly callous with a transverse rima at the axilla; the lower ones 6–7 cm. long, with 8–9 spikelets on each side; these very regularly distichous, horizontally inserted with a conspicuous axillary callus, gradually shorter, complanate; the lowest ones, the largest, 18–22 mm. long, with 10–12 very regularly inserted flowers on each side; those of the summit few-flowered; the axis of the spikelets very slender and closely sinuous; spathels narrow at the base with a suddenly expanded broad concave sub-bracteiform deflexed veined acute limb; involucre subtended by its spathel, shallowly calyculiform, rather acutely 2–3-toothed. *Male flowers* contiguous, distichous or pectinate on one plane, inserted at an angle of 45°, elongate-cylindraceous, acute, 3 mm. long, 1 mm. thick; the calyx tubular, flattish at the base, obsoletely striately veined outside, divided down almost to or a little above the middle into 3 broad acute lobes, these with a slender subscarious margin; the corolla twice as long as the calyx, divided almost to the base into 3 lanceolate, acute, rather opaque segments; stamens sub-biseriate, 3 of them being longer than the others, the filaments subulate with inflected apices when in the bud; anthers ovate-oblong, sub-sagittate, obtuse at the apex; rudimentary ovary formed by 3 small agglutinate bodies which reach about to the base of the anthers. *Female spadix* simply decompound, otherwise similar to the male one, in some specimens rather strongly clawed in the attenuated portions of the axis between two partial inflorescences; primary spathes as in the male, but commonly partially rotten and deciduous at the maturity of the fruit; partial inflorescences erect when in flower, nodding when in fruit, more slender than in the male spadix, more or less shorter than their own spathes, the larger ones 30–35 cm. long at most and with many spikelets, but usually 15–20 cm. long, and with 6–10 spikelets on each side; these at first erect, later horizontal, very conspicuously callous in their axilla, usually 5–7 cm. long with 10–14 flowers on each side, and with the axis closely sinuous and somewhat tumescent between the insertion of each flower; the young spikelets with four distinct series of flowers, the neuter ones being rather conspicuous; spathels tubular-infundibuliform, closely sheathing, apiculate at one side; involucrophorum exsert from its own spathel, laterally attached at the base of the one above (apparently to the axis), disciform, almost flat, with a small entire or lobulate limb; involucre very shallow, flat, similar to the involucrophorum; areola of the neuter flower much depressed, linear with a central tuberculiform scar. *Female flowers* conic-ovoid, acute, obsoletely trigonous, 3 mm. long; the calyx shortly and acutely 3-toothed, subinflated and callous at the base, not or indistinctly veined outside; the corolla slightly longer than the calyx, the segments lanceolate, very acute; stamens with the filaments united into a cup, which is crowned by 6 subulate teeth; anthers sagittate. *Neuter flowers* slightly smaller than the female ones, thinner and with the corolla much longer than the calyx. *Fruiting perianth* shortly pedicelliform. *Fruit* very small, sphaeric, pisiform (7 mm. in diam.), topped by a small distinct beak; scales in 18 series, narrowly and sometimes very faintly channelled along the middle, subshining, lightyellow with a very distinct chocolate-brown intra-marginal line which is more extended towards the point, this rather prolonged and erosely fringed; margins narrowly scarious, pale, erosely toothed. *Seed* depressedly orbicular, 5–6 mm. in diam., convex and boldly tubercled on the dorsal side, depressed on the raphal side with a central circular deep chalazal fovea; albumen equable; embryo basal.—The plant acquires in herbarium specimens an uniform reddish-brown colour.

HABITAT.—Bengal, Assam, the Khasia Hills, Silhet, Chittagong and Burma. Hamilton gives the locality of Jelpigore in the prov. of Rungpoor (N. Bengal) lat. 26° 30′ for the type specimens. I have seen examples from the following localities: Khasya ranges, *Wallich* No. 8614 Herb. Kew.; Assam, *Griffith, Jenkins;* on the banks of the Dhunsiri, and Naga Hills, *G. Mann*; in Cachar, *R. L. Keenan* in Herb. Kew.; and on the Chatter Chur Hills, *G. Mann* in Herb. Becc.; at Doodputli, *Hooker & Thomson* in Herb. Kew.; in Chittagong at Paroha, *Gamble*; at Seetakoond and Kaji-ke-nath, *Hooker & Thomson* in Herb. Kew.; S. E. Bengal at Noakally at the mouth of the Megna *Hooker & Thomson* in Herb. Kew.; Silhet, *Hooker & Thomson* in Herb. Kew.—Native names "Onabi Bheṭ" (G. Mann.), "Sundi Beṭ" and "Quabi Beṭ" (Gamble) in Assam. "Kyeingnee" (Gamble) in Burma.

OBSERVATIONS.—A very variable plant on account of its rather wide distribution in India, but well characterised amongst the species of the group by the leaves with numerous narrow equidistant subtricostate not shining and concolorous leaflets; by the spadices with very elongate broadly linear spathes (when expanded), which are longer than the respective partial inflorescences; and by the small sphaeric pisiform fruit.

I believe that no possible doubt can remain as to the identity of *C. Mastersianus* Griff. with *C. Guruba* Ham.

PLATE 114.—Calamus Guruba *Ham.*—An entire male spadix; portion of the upper part of a leaf (lower surface) and another portion from near the base.—From a specimen collected by Mr. G. Mann in March 1886 on the Chatter Chur Hills in Cachar (Herb. Becc.).

PLATE 115.—Calamus Guruba *Ham.*—Leaf-sheath with the base of a leaf and a fruit spadix; portion of a female spadix in flower; the summit of a leaf (lower surface); detached fruits and seeds.—From specimens collected on the Naga Hills in Assam by G. Mann (H. Becc.).

94. **CALAMUS NITIDUS** Mart. Hist. Nat. Palm. iii (1st edit.), 211 and 334; Kunth Enum. Pl. iii, 211; Walp. Ann. iii, 484 and v, 830; Griff. in Calc. Journ. Nat. Hist. v, 49 and Palms Brit. Ind. 59; Miq. Fl. Ind. Bat. iii, 117; Hook. f. Fl. Brit. Ind. vi, 449.

DESCRIPTION.—Probably scandent and slender. *Leafsheaths* . . . . . *Leaves* not cirriferous, about 60–70 cm. long (their base not seen by me); petiole . . . . . ; rachis glabrescent, acute and bifaced above, armed beneath along the middle with solitary relatively long and slender suddenly deflexed claws; leaflets numerous, equidistant, alternate or subopposite, closely set (15–18 mm. apart), narrowly lanceolate or oblanceolate, almost equally narrowed to both ends, acute at the base, subulately acuminate at the summit, thinly papyraceous, subshining on both surfaces, barely paler beneath; their mid-costa very acute above, where bristly from the middle upwards, and accompanied on each side by two slender secondary nerves which are bristly from the base, therefore the upper surface is furnished with five bristly nerves; beneath the mid-costa is not prominent an is very sparingly spinulous, the side-nerves are smooth; margins very appressedly and inconspicuously spinulous; transverse veinlets very slender above, indistinct beneath; the largest leaflets, the lowest, 15–16 cm. long, 14–15 mm. broad; the upper ones slightly shorter; the two of the terminal pair 10–12 cm. long, slightly narrower than the others, quite free at the base. *Male spadix* very slender, filiform, 50 cm. up to 1 metre in length, with rather many (6–7) partial inflorescences 10–15 cm. apart and with a very slender filiform aculeolate flagellum at its summit, ultradecompound, with a short flattened peduncular portion, which is armed at the sides with slender horizontal spines; its axial portions between two partial inflorescences very slender, 1·5–2 mm. thick, subterete or obscurely angular, rather densely armed on the outer side with scattered or more or less confluent slender claws; primary spathes elongate, at first tubular and subventricose in the middle, bursting longitudinally during the anthesis and—with the exception of a small tubular basilar portion—open, flat, persistent, exsuccous, papyraceous, glabrous, of a cinnamon-brown colour, subshining, finely striate longitudinally inside, paler outside, somewhat longer than their respective inflorescences; the lowest about 20 cm. long and 15 mm. broad with two acute and spinulous carinae; the upper ones smooth or sparingly spinulous at the base on the back; partial inflorescences erect or erecto-patent, rather dense, ovoid-pyramidate in outline, the larger ones panicled, the lowest about 15 cm. long, their axis straight and slender, with 10–12 bifarious branchlets on each side which have a tendency to a unilateral arrangement; the largest branchlets, the lowest, 3–4 cm. long, with 8–10 very small spikelets on each side; secondary spathes glabrous, cylindraceous and closely sheathing in their lower portion, somewhat expanded at their summit into an obliquely truncate limb, this entire at the mouth and prolonged at one side into a subulate point; branches branchlets and spikelets inserted at the mouth of their respective spathes and with a very distinct axillary callus and its transverse rima; spikelets very small and short; the larger ones 5–7 mm. long with 5–7 approximate bifarious flowers on each side, the two series often slightly unilateral; spathels very closely packed, bracteiform, concave, their points acuminate, patent or deflexed and subtending the involucre; this inserted at the base of the spathel above its own, calyculiform, concave, subcymbiform, strongly veined, acute right and left. *Male flowers* narrow, elongate, subterete, acuminate at the summit into a subtrigonous point, 2·5 mm. long and barely more than ·5 mm. thick; the calyx cylindraceous, strongly striately veined, divided down to a little above the middle into 3 triangular acute lobes; the corolla twice as long as the calyx, its segments lanceolate, acuminate, striately veined outside; stamens biseriate with the filaments thick and agglutinate at the base, subulate upwards and with inflected apex when in the bud; anthers elongate, subsagittate; rudimentary ovary very small. *Female spadix* like the male one, but simply decompound; lower partial inflorescences with 9–12 distichous horizontal or slightly deflexed spikelets on each side; the upper inflorescences smaller, with 3–4 spikelets only, all with a distinct axillary callus at their insertion; spathels very approximate, very shortly tubular at the base and suddenly expanded into a broadly infundibuliform, strongly veined, glabrous not ciliate and at one side acute limb; involucrophorum subtended by its own spathel and attached at the base of the one above, almost explanate and apparently formed by two triangular bracts which are united by their bases and acute right and left; involucre smaller than the involucrophorum and like this strongly veined, calyculiform, shallow, bracteiform, irregularly trigonous-tridentate; areola of the neuter flower. punctiform, sometimes accompanied by two very small bracteolae. *Female flowers* elongate-conic, acute, 2·5 mm. long; the calyx finely striately veined, shortly and acutely 3-dentate; the corolla barely longer than the calyx, its segments lanceolate, acuminate, finely striately veined; filaments of the stamens united by their bases and forming a cup which is crowned by 6 triangular teeth; these with subulate and inflected apex; anthers halbert-sagittate, flattened and sterile. *Neuter flowers* almost as large as the female ones. *Fruiting perianth* shortly pedicelliform. *Fruit* very small (not seen perfectly ripe).

Habitat.—Tavoy in Tenasserim, *Wallich* No. 8609 in Herb. Kew.; *Helfer* Nos. 6390, 6396, 6398 in Herb. Kew.; the No. 6390 also in St. Pet. Herb.

Observations.—Very similar to but distinct from *C. Guruba* by its lanceolate leaflets with 5 bristly nerves above, the mid-costa only acute and the side-nerves very slender; from other species and mainly from *C. platyspathus*, to which it is also related and which it much resembles in the spadices, this differs in the lanceolate closely set equidistant numerous concolorous leaflets and in the spathes somewhat longer than the inflorescences. The description of the female spadix is derived from Wallich's specimen with immature fruit (No. 8609 in Herb. Kew.).

Plate 116.—Calamus nitidus *Mart.* The summit of a leaf (lower surface); a pair of leaflets (upper surface); two portions of male spadices.—From Helfer's specimens in Herb. Kew.

95. Calamus platyspathus Mart. Hist. Nat. Palm. iii, (1st edit.) 210; Griff. in Calc. Journ. Nat. Hist. v, 75 and Palms Brit. Ind. 83; Kunth Enum. Pl. iii, 209; Miq. Fl. Ind. Bat. iii, 99; Kurz in Journ. As. Soc. xliii, II, (1874), 208; H. Wendl. in Kerch. Les Palm. 237; Hook. f. Fl. Brit. Ind. vi, 450; Becc. in Rec. Bot. Surv. Ind. ii, 207.

Daemonorops platyspathus Mart. l. c. 2nd edit. 206 and 329; Walp. Ann. iii, 479; Miq. Fl. Ind. Bat. iii, 99.

Description.—Slender, scandent. *Sheathed stem* 7 cm. in diam. (in one specimen). *Leaf-sheaths* armed with rather numerous, very unequal, straight flat subulate narrow horizontal spines. *Ocrea* elongate, membranous, exsuccous. *Leaves* short, non-cirriferous; petiole short, rachis bifaced, very acute and smooth above, roundish beneath in its first portion, where armed with a few long (1–2 cm.), straight, rather strong, usually solitary, slightly deflexed, subulate, dark-tipped spines, which leave deep impressions on the rachis, have a broad base and are transformed upwards into relatively robust irregularly and remotely scattered claws; these with a rather long and strongly deflexed point; leaflets very few, 8–12 cm. apart, all about of the same size and shape, the larger ones 30 cm. long and 25–28 cm. broad; the two of the terminal pair a few cm. shorter and quite free at the base, elongate-lanceolate or broadly ensiform, attenuate at the base, gradually acuminate into a subulate apex, streaked above with a few narrow longitudinal shining bands of which one is near the lower margin; otherwise the upper surface is opaque with 5–6 not very strong but acute costae, of which the mesial is scarcely stronger than the side ones and naked, whereas these last are occasionally spinulous; the lower surface of a light-ferrugineous colour and very faintly pulverulent or subtomentose-furfuraceous (when young?), with smooth not prominent nerves; transverse veinlets remote and much interrupted; margins inconspicuously closely appressedly spinulous, the spinules more spreading towards the summit. *Male spadix* very slender, filiform, ultradecompound, in one specimen 65 m. long with 6 partial inflorescences, which are inserted at equal distances, and with a short aculeolate filiform rudimentary flagellum at its summit; primary spathes at first enclosing the inflorescences, then bursting longitudinally, very shortly sheathing at the base, otherwise open flat and laminar, about as long as the inflorescences, papyraceous, exsuccous, narrowly oblong or very broadly linear, obtuse or subtruncate at the apex, yellowish-brown externally and fugaciously scaly-furfuraceous and paler than inside, where perfectly glabrous, shining and closely longitudinally striate; the lowest spathe not differing from the others, 10 cm. long and 13 mm. broad, with a narrowly tubular and flattened base, this spinous at the sides, and with two slightly spinulous carinae; the upper spathes and inflorescences gradually shorter; axis of the spadix filiform, subterete, about one mm. thick, smooth in its lower portion, unilaterally armed with delicate solitary claws upwards; partial inflorescences erecto-patent, panicled, ovate in outline, with a somewhat unilateral arrangement in all their divisions, the largest the lowest, 10 cm. long, bearing on each side 6–7 branchlets; these spreading, inserted with a very conspicuous axillary callus, gradually diminishing, the larger ones, the lowest, about 3 cm. long with 4–5 spikelets on each side; secondary spathes sparsely rusty-furfuraceous at first, later glabrous, narrowly tubular-infundibuliform, closely sheathing and prolonged at the summit into a small membranous subulately pointed limb; spikelets short, patent and like the branchlets with a very distinct axillary callus and a transverse rima, the larger ones, the lowest, 8–10 mm. long with only 4–5 approximate bifarious flowers on each side; the upper spikelets shorter and very few-flowered; spathels short, asymmetrically infundibuliform, acute or acuminate, the point subtending the involucre; this inserted at the base of the spathel above its own, calyculiform, slightly concave, transversely subcymbiform, acute right and left. *Male flowers* glabrous, narrow, elongate, subterete, acute or apiculate, 2·5 mm. long, and ·6 mm. thick; the calyx with a short subcampanulate not veined tube, its teeth broad and acute; the corolla two and a half times as long as the calyx, divided down past the middle into three oblong apiculate segments, smooth outside; stamens with filaments united by their bases, subulate in their upper part and with inflected apices; anthers narrowly sagittate, acute; rudimentary ovary very small, enclosed in the tube which is formed by the united bases of the stamens. *Female spadix* and *fruit* unknown.

HABITAT.—Tavoy in Tenasserim, *Wallich* No. 8610 in Herb. Kew and St. Petersburg.—Rediscovered in 1900 in Tavoy, Nabule Rocks, *Shaik Mokim* No. 300 (Herb. Calc.).

OBSERVATIONS.—Of Wallich's specimens I have seen one male spadix and a portion of a leaf in the Herbarium at Kew and another male spadix in that of St. Petersburg. The leaf measures 50 cm. in length, has only 6 leaflets in all, and seems almost entire, apparently wanting only the base. *C. platyspathus* is easily distinguished amongst the species of the group by its few, remote, rather large, long and broad many-costate subconcolorous leaflets and by the very slender male spadix with open flat laminar spathes which are as long as the inflorescences, and by the very narrow cylindraceous flowers with a long corolla. The Calcutta specimen from Tavoy bears a small portion of the stem with a male spadix and a portion of a leaf, which corresponds in its general characters with Wallich's specimens, but the leaflets are somewhat shorter (15–16 cm. long) and are whitish-mealy beneath.

PLATE 117.—Calamus platyspathus *Mart.* The entire Wallichian specimen No. 8610 in the Herbarium at Kew.

96. CALAMUS MYRIANTHUS Becc. in Hook. f. Fl. Brit. Ind. vi, 451 and in Rec. Bot. Surv. Ind. ii, 207.

DESCRIPTION.—Probably scandent and of moderate size. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* (not seen entire); petiole . . . . . ; rachis in its intermediate portion acutely bifaced above, slightly convex beneath, where armed along the middle with long straight spines and at the sides with small claws; leaflets large, rather remote (probably inequidistant), alternate or subopposite, elongate-lanceolate or narrowly elliptic-lanceolate, equally attenuate to both ends, acute at the base, inserted at an acute angle, acuminate at the summit into a somewhat bristly apex, 40–42 cm. long and 4–5 cm. wide, thinly papyraceous plicate longitudinally closely and superficially, with 8–10 slender almost equal, costae, which are usually naked or more rarely furnished with a few spinules above, and are less prominent beneath where sprinkled, chiefly towards the summit, with small spinules, otherwise the upper surface of the leaflets is opaque except for one or two longitudinal shining bands, of which one is usually along the lower margin; the undersurface is submealy or covered with an ashy-grey or whitish very thin indumentum; the margins very minutely and appressedly spinulous. *Male spadix* very delicate, elongate, filiform, flagelliform, ultradecompound; the slender axial portions between two partial inflorescences armed with scattered solitary or confluent claws, with many 15–25 cm. apart partial inflorescences; primary spathes not seen entire by me, but apparently very narrow, lacerate and longer than the inflorescences; partial inflorescences panicled, elongate-pyramidate, 15–20 cm. long, with a very slender but rigid straight axis and with 7–10 distichous subunilateral branchlets on each side, which are spreading or horizontal during the anthesis; the largest branchlets, the lower ones, 4–6 cm. long, with 8–10 spikelets on each side, these inserted like the spikelets with a distinct axillary callus; secondary spathes glabrous, unarmed, very narrowly tubular and closely sheathing, suddenly expanded near the summit into a short broadly infundibuliform membranous limb; this entire, obliquely truncate at the mouth and extended at one side into a triangular acute or acuminate spreading point; spikelets very delicate and small with a slender zig-zag sinuous axis, the largest, the lower ones 12–15 mm. long with 8–10 flowers on each side; the upper ones shorter and with fewer flowers; spathels shortly tubular at the base, suddenly expanded upwards into a broad bracteiform acute or acuminate patent point; involucre almost horizontally subtended by its own spathel and attached at the base of the one above, calyculiform, rather shallow and apparently formed by two triangular acute bracts united by their bases. *Male flowers* very small, 2 mm. long, trigonous-pyramidate, acuminate; the calyx strongly striately veined, divided down about to the middle into 3 broadly triangular acute teeth, which have a scarious margin; the corolla about twice as long as the calyx, almost entirely divided into 3 lanceolate-acuminate subpolished segments; stamens sub-biseriate, 3 of them longer than the others, the filaments united by their bases, subulate with inflected apex in the bud, anthers elongate-sagittate acute; rudimentary ovary formed by 3 concrescent elongate bodies, which reach about halfway up the filaments. *Female spadix* and *fruit* unknown.

HABITAT.—Tenasserim; in the Province of Mergui, *Helfer* No. 6397 in Herb. Kew., St. Petersb. and Berlin.

OBSERVATIONS.—The specimens upon which this species is based consist only of some portions of a male spadix and a few detached leaflets, but nevertheless it seems to me a well-characterised species, though related to *C. Guruba* and *C. ramosissimus*, and distinguished in the group by its large elongate elliptic-lanceolate many-costate leaflets, which are green above and whitish beneath; the elongate slender spadices with many partial rather remote inflorescences; and the very minute trigonous acuminate male flowers. The spathes have been torn in the specimens seen by me, but by their vestiges they seem longer than their respective inflorescences, thin and filamentous in texture, and soon destroyed.

PLATE 118.—Calamus myrianthus Becc. An intermediate portion of a leaf, with two leaflets and portions of a male spadix. From Helfer's No. 6397 in Herb. Berol.

97. CALAMUS HYPOLEUCUS Kurz, For. Fl. Brit. Burma, ii, 523 (excl. descr. male spadix); H. Wendl. in Kerch. Les Palm. 236; Hook. f. Fl. Brit. Ind. vi, 451; Becc. in Rec. Bot. Surv. Ind. ii, 207.

Daemonorops hypoleucus Kurz in Journ. Asiat. Soc. Beng. xliii, II (1874) 208 (partly as to descr.) and pl. XVIII (excl. pl. XIX).

DESCRIPTION.—Slender and apparently scandent. *Sheathed stem* 7–8 mm. in diam. *Leaf-sheaths* (not flagelliferous) slightly gibbous above, brown when dry (like the other parts of the plant except the lower surface of the leaflets) with vestiges of furfuraceous patches and thence probably mottled, armed with small (5–7 mm. long) flat broad-based elongate-triangular spines; these intermingled with other spines of the same shape but much smaller; a few spines at the mouth of the sheath and at the base of the petiole are longer than the others. *Ocrea* membranous, truncate, then brittle and deciduous. *Leaves* short, not cirriferous, in one specimen 45 cm. long; petiole short (4 cm. long), subshining and yellowish-brown like the rachis, deeply channelled above, rounded beneath; the margins acute, smooth or scantily spinulous, rachis in its upper surface flat in the first portion and bifaced upwards, rounded and armed beneath along the middle, and sparsely also at the sides, with solitary rather strong black-tipped claws; these more numerous in its terminal portion; leaflets few (in one leaf 17 in all) very distinctly grouped, with vacant spaces 8–10 cm. in length, usually disposed in opposite pairs, papyraceous, slightly concavo-convex, elliptic-lanceolate or oblong-lanceolate, narrowed to and rather acute at the base, shortly acuminate from near the apex into an acute bristly point, opaque on the upper surface, where bordered along the lower margin with a broad shining band, conspicuously mealy-white beneath, with 7–9 slender but distinct costae, of which the mesial is barely stronger than the others, all smooth on both surfaces; transverse veinlets moderately crowded, rather distinct and much interrupted; margins acute, naked near the base, ciliate with small spreading spinules near the summit; the largest leaflets, the intermediate ones, 13–22 cm. in length, 3–4·5 cm. broad, those near the base narrower and shorter; the two of the terminal pair a trifle smaller than the others, quite free at the base. *Male spadix* . . . . . *Female spadix* very short and comparatively compact, in one specimen 15 cm. long, attached near the mouth of its leaf-sheath with a distinct axillary callus and transverse rima; its peduncular part 3 cm. long, compressed, flat on the inner side, slightly convex on the back, armed at the margins with straight slender spines; primary spathes imbricate, relatively large, broad, concavo-cymbiform, elliptic, narrowed to both ends, acute at the summit, thinly papyraceous, exsuccous, brown, fragile, glabrous, subnitescent inside, opaque and paler outside; the lowest very shortly tubular at the base, ventricose, almost entirely enveloping the others, with two faint sparingly spinulous keels on the back; the others (4–5 smooth, longer than their respective inflorescences, the one overlapping or partially covering that immediately above, and gradually smaller; partial inflorescences small, embraced by and shorter than their respective spathes, erect, ovate, rather dense, with an acutely zig-zag sinuous axis, the largest, the lowest, 5 cm. long with 6–7 spikelets on each side; secondary spathes small, tubular, angular by pressure, slightly enlarged above, finely striately veined, prolonged at the summit into an elongate entire subulately acuminate point; spikelets erect, their axis very strongly and very suddenly zig-zag sinuous, the lower ones, the largest, 12–15 mm. long with 5–6 distichous (♀) flowers on each side, the upper ones shorter and few-flowered; spathels (small) irregularly infundibuliform, angular by pressure of the flowers, considerably extended at one side into a triangular acuminate patent strongly striately veined point; involucre horizontally subtended by its own spathel and attached at the base of the one above, irregularly disciform, explanate; involucre calyculiform, almost explanate, with 3 acute strongly veined lobes; the areola of the neuter flower depressedly sublunate. *Female flowers* very small, 2 mm. long, ovate-conic, acute, with a flat base; the calyx striately veined, callous at the base, shortly 3-toothed; the corolla scarcely longer than the calyx, divided down almost to the base into 3 narrowly lanceolate acute segments; stamens united by their bases and forming a not very high ring or cup, crowned by 6 short triangular teeth; anthers broadly sagittate. *Neuter flowers* apparently very well developed, longer and narrower than the female ones (3 mm. long), obsoletely trigonous, attenuate and acute at the summit; the calyx tubular-companulate, 3-toothed, striately veined; the corolla twice as long as the calyx, divided down about to the middle into 3 narrowly lanceolate acuminate segments; stamens with subulate rather thick filaments, which are united together and to the undivided portion of the corolla; the anthers ovate, obtuse, abortive; no rudiment of an ovary (?). *Fruit* unknown.

Habitat.—Burma, at Thoungyeen in the Karen country (18° N. lat.), discovered by *Sir D. Brandis* (Kew and Calcutta Herb.).

OBSERVATIONS.—This is a species very distinct by the short contracted ♀ spadix with large concave imbricate spathes, recalling those of some species of *Daemonorops;* by the leaves with grouped large many-costate lanceolate or oblong leaflets, which are conspicuously white beneath; and by the small spikelets with very acutely zig-zag sinuous axis. The type-specimen preserved at Kew consists of the upper part of a female spadix with rather young flowers and of one entire leaf; another portion of a leaf, detached from the above specimen, is in the Calcutta Herbarium; in this the leaflets are larger than in the other. The Kew specimen has 2 leaf-sheaths, one of these bears the spadix; the other, the higher one, has a very rudimentary filiform spadix 5 cm. in length.

PLATE 119.—Calamus hypoleucus *Kurz.* The entire type-specimen in the Herbarium at Kew.

98. CALAMUS LEUCOTES Becc. sp. n.

C. hypoleucus Kurz Fl. Brit. Burma ii, 523 (as to the male spadix only).

Dæmonorops hypoleucus Kurz in Journ. Asiat. Soc. Beng. xliii. II (as to plate XIX only).

DESCRIPTION.—Probably scandent. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* not gibbous above (sometimes flagelliferous?) completely covered with two kinds of spines; some of them rather large, flat, laminar, elastic, sublanceolate, 3–4 mm. broad at the base and up to 3 cm. long, scattered, ascendent, shining and brown, while others, which are far more numerous, are smaller, very narrow, acicular, ascendent or spreading and never deflexed; near the mouth the spines are more crowded, very narrow, needle-like and as much as 7–8 cm. long. *Ocrea* short, hidden amongst the mass of the spines. *Leaves* rather robust and relatively short, not cirriferous; petiole robust, 1 cm. thick and rather long (20 cm.), flat and smooth above, rounded beneath where covered with numerous small spines of various sizes some of them not more than 5–6 mm. long, spreading or horizontal, not deflexed and broad-based; others, those along the middle, strong, solitary and hooked; the margins acute and also prickly; rachis in its upper portion acutely bifaced above, and rather convex beneath, where strongly armed with scattered or irregularly aggregate rather robust claws; leaflets large, not numerous, very inequidistant, irregularly grouped into various fascicles of a few, with long (15–18 cm.) vacant spaces amongst them, and a terminal fascicle of 4; papyraceous, rigid, longitudinally plicate, lanceolate or elliptic-lanceolate, almost equally narrowed to both ends, acute at the base where there is a distinct callus at its axilla and another beneath in the hollow formed by the plicature of the limb, acuminate at the summit into a subulate limb, conspicuously discolorous, green, glabrous and opaque above, covered beneath with a thin crustaceous chalk-white indumentum, with 7–8 almost equal costae; these naked on both surfaces, raised above and almost depressed beneath; the largest leaflets 40 cm. long, 5·5 cm. broad; the two of the terminal pair very shortly united by their bases. *Male spadix* probably elongate (not seen entire by me), supradecompound, with a short flattened 1 cm. broad peduncular portion which is densely prickly like the petiole; its axis rigid, 4 mm. thick, subterete or obsoletely angular armed externally with solitary or more or less aggregate claws and with rather distant partial inflorescences; primary spathes very elongate, longer than the inflorescences shortly tubular at the base, flat, open, laminar, broadly linear (14–16 mm. in width) upwards, where they are, besides, almost shining, very finely longitudinally striate and of an umber-brown colour inside, and paler outside; the lowest spathe about 40 cm. long, acutely two-keeled in its lower portion, spinous on the keels, unarmed above; partial inflorescences narrow, densely flowered, strict, erect, paniculate-cupressiform; the two lowest 20 cm. long (the upper ones not seen by me), their axis straight, rigid, with many also erect strict cupressiform branchlets, of which the lower ones 4–5 cm. long with 8–10 very slender spikelets on each side; secondary spathes small unarmed, tubular, cylindraceous at their base, extended upwards into an erect subscarious exsuccous broadly triangular and acuminate limb; spikelets very small, with a filiform rigid zig-zag sinuous axis, inserted at the mouth of their own spathe, not callous in the axilla, the largest, the lower ones, 10–12 mm. long with 6–7 flowers on each side; spathels very small, infundibuliform, attenuate and angular at the base, enlarged above into a patent concave triangular acute limb; involucre subtended by its own spathel and attached at the base of the one above, concave, calyculiform, subtrilobate, the lobes acute. *Male flowers* ascendent, inserted at a very acute angle, small, 3 mm. long, narrowly ovate, obsoletely trigonous, acute or subacuminate; the calyx striately veined, divided down almost to the middle into 3 broad semiovate acute lobes, which have broad translucent margins; the corolla twice as long as the calyx, its segments acuminate, polished outside.—Other parts unknown.

HABITAT.—Burma; at Yoonzuleen, lat. 8° N., *Sir D. Brandis,* March 1880 (H. Becc.).

OBSERVATIONS.—I have seen of this only a portion of the sheathed stem, with the base of a male spadix and portions of a leaf. To this species belongs Kurz's plate XIX l. c. of *C. hypoleucus,* as that figure has been drawn from the same specimen of which Sir D. Brandis has kindly given me a portion.

C. leucotes is very closely related to *C. myrianthus,* but it is a much more robust plant, with the leaflets distinctly covered by a thin chalky-white coating on their lower surface; more rigid male spadix; erect strict cupressiform partial inflorescences with their branchlets and spikelets not callous at their insertion and with large flowers.

PLATE 120.—Calamus leucotes *Becc.* Portion of the stem with base of a leaf and lower portion of a male spadix; summit of a leaf; detached leaflets seen from the lower surface (right-hand side of the plate); a leaflet from the upper surface.—From Sir D. Brandis's authentic specimen in Herb. Beccari.

99. CALAMUS TRAVANCORICUS Bedd. MS. in Herb. Kew.; Hook. f. Fl. Brit. Ind. vi, 452; Becc. in Rec. Bot. Surv. Ind. ii, 207;

C. gracilis (not of Roxb.) Griff. Palms Brit. Ind. 64. (as to Rheede's plate only).

Tsjeru isjurel, Rheede, Hort. Mal. xii (1603), 121, pl. LXIV.

DESCRIPTION.—Slender scandent. *Sheathed stem* 7–8 or at most 10 mm. in diam. *Leaf-sheaths* not or slightly gibbous above, sometimes flagelliferous, more or less densely armed with straight, slender, rather long horizontal spines, which are dark-coloured with a light base and scaly-fringed at the margins and are intermingled with smaller ones or with short rigid bristles or even with spinescent tubercles; near the mouth the spines are crowded, more slender and sometimes changed into bristles or into more or less distinctly seriate asperities. *Ocrea* short, membranous, very obliquely truncate *Leaf-sheath flagella* very slender, filiform, feebly armed with small claws. *Leaves* short, 40–50 cm. long, not cirriferous; petiole short (5–7 cm. long) flattish or slightly channelled above, rounded beneath, where sparingly prickly or even transversely scabrid, the margins acute and with a few straight spines especially near its base; rachis acutely bifaced and smooth above, somewhat irregularly and weakly clawed beneath; leaflets not very numerous, 20–30 in all, distinctly grouped into 3–4 fascicles; these 3–10 cm. apart, each composed of 3–5 very approximate leaflets on each side, all on one plane, viz., not pointing in different directions (the groups of one side opposed to those of the other side), thin in texture, subherbaceous, green even when dry, barely paler beneath, very narrowly oblanceolate, long and gradually attenuate to the base, subulately acuminate from their upper third part into a filamentous tip (this shortly bristly at the margins), with 3 very slender costae, which are often accompanied by two others more delicate (one on each side); the 3 main costae and sometimes also the other two more or less spinulous above, on the under surface all nerves slender and only the mid-costa occasionally spinulous near the summit; margins very minutely closely and appressedly spinulous; transverse veinlets very fine, sinuous, much interrupted; all leaflets of about the same shape and size, those of the lowest group slightly the largest, 15–18 cm. long, 10–15 mm. broad; the two of terminal pair quite free at the base. *Male spadix* ultradecompound, very slender, about 1·2 m. in length, including a terminal slender filiform finely aculeolate flagellum (this 60 cm. long) with 6–7 partial inflorescences; primary spathes elongate, 12–15 cm. long, tubular and slightly ventricose or subtorulose in the middle when enclosing the inflorescences than which they are considerably longer, later more or less partially bursting longitudinally and expanded, at least in their central portion where 10–12 mm. broad, membranous, exsuccous, glabrous, yellowish-brown, darker inside; the lowest primary spathe flattened and acutely two-edged in its basal portion; the edges spinulous, with two superficial almost unarmed and evanescent carinae in its upper part; partial inflorescences small, panicled, rather dense, ovate, spreading, 7–8 cm. long at most, with 3-4 subdistichous branchlets on each side of the very slender and very sinuous axis, the lower branchelets, the largest, with 5–6 distichous spikelets on each side; secondary spathes elongate-infundibuliform, smooth, closely sheathing, truncate and naked at the mouth, acute or acuminate at one side; spikelets small, slightly arched, very spreading, horizontal or even deflexed, the largest, the lower ones, 7–8 mm. long with 4–5 distichous flowers on each side; the axis very slender zig-zag sinuous; upper spikelets smaller, very few-flowered; the inflorescences, branchlets and spikelets have a very conspicuous callus at their insertion; spathels infundibuliform above, truncate and entire at the mouth, where acute at one side, narrow at the base; involucre subhorizontally subtended by its own spathel and attached at the base of the one above, calyculiform, slightly concave, subtrigonous, 3-dentate. *Male flowers* oblong, cylindraceous or very obsoletely trigonous, obtuse or subapiculate, 3·5 mm. long; the calyx campanulate, striately veined, with 3 short broadly triangular acute teeth; the corolla more than twice as long as the calyx, divided down to its lower third-part into 3 oblong, rather acute, externally polished segments; stamens with filaments united by their bases, subulate, inflected at the apex in the bud; anthers sagittate, acute; rudimentary ovary as long as the connate part of the filaments. *Female spadix* simply decompound, similar to the male one but with fewer inflorescences (3 in one specimen); these small with a very sinuous axis and 4 distichous spikelets on each side; primary and secondary spathes as in the male spadix; spikelets small, the larger ones 12–15 mm. long with a very sinuous axis and very few (3–4) distant flowers on each side; spathels elongate, narrow, angular and curved in their lower portion, infundibuliform, acute or acuminate at the summit; involucrophorum shortly pedicelliform, distinctly callous at its axilla next to the axis, horizontally subtended by its own spathel and attached at the base of the one above, with a very short discoid limb; involucre calyculiform, suborbicular, slightly concave; areola of the neuter flower depressed, linear. *Female flowers* conic-ovoid, 2·5 mm. long; the calyx flat and callous at the base, strongly striately veined outside, shortly 3-toothed; segments of the corolla slightly longer than the calyx, lanceolate, acute, polished outside; stamens with filaments united by their bases and in the free portion triangular subulate; anthers large, sagittate. *Neuter flowers* narrower but slightly longer than the female ones, with the corolla twice as long as the calyx. *Fruiting perianth* probably pedicelliform, as the calyx is already callous at the base during anthesis. *Fruit* not seen by me: in Rheede's plate globose-ovoid, 8–10 mm. long, mucronulate.—The different parts of the plant, except the leaflets, more or less fugaciously rusty-furfuraceous.

HABITAT.—Lower India: Malabar, *Rheede.* Rediscovered by *Major Beddome* in Travancore (Herb. Kew.) and by *Lawson* (Herb. Calc.).

OBSERVATIONS.—This species of which Rheede had given a figure which is very good for its time, had not been found again till lately. A good male specimen existed, however, at Kew from Griffith's Herbarium bearing the No. 1141 and probably coming from Dr. Wight.

Very distinct by its slender stem; the sheaths armed with slender prickles; the short leaves with not numerous, very distinctly grouped narrowly oblanceolate leaflets, recalling much in their arrangement those of *C. gracilis* (to which Rheede's figure had been attributed by Griffith); by the long slender spadices with spathes longer than the small inflorescences, enfolding these at first and then more or less bursting longitudinally; and by the pedicelliform involucrophorum of the female spikelets.

PLATE 121.—Calamus travancoricus *Bedd.* An entire leaf: lower surface; portion of a female spadix (on the right hand side); an entire male spadix (the above figures from Beddome's specimens in Herb. Kew.); portion of the stem with an entire flagellum and base of a leaf, from Lawson's specimen in Herb. Calc.

100. CALAMUS RHEEDEI Griff. in Calc. Journ. Nat. Hist. v, 73, and Palms Brit. Ind. 36 and 83; H. Wendl. in Kerch. Les Palm., 237; Hook. f. Fl. Brit. Ind. vi, 452; Becc. in Rec. Bot. Surv. Ind. ii, 207.

Daemonorops Rheedei Mart. Hist. Nat. Palm. iii, 330; Miq. Fl. Ind. Bat., iii, 100; Walp. Ann., iii, 479, and v, 828.

Katu-tsjurel, Rheede Hort. Mal. xii, 123, pl. LXV.

DESCRIPTION.—Scandent slender or of moderate size (?). *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* not cirriferous, petiole and rachis rather densely clawed; leaflets not numerous, narrowly lanceolate, unicostate (?), gradually attenuate at the base, acuminate, distinctly grouped in 4 fascicles with long vacant spaces interposed, the fascicles of three, of which apparently one leaflet of each group on one side of the rachis and two of the other; 5 leaflets terminate the rachis; the two of the terminal pair free at the base. *Female spadix* elongate, clawed in its axial portions, with a few dense paniculate remote partial inflorescences which are shorter than the flat open spathes. *Fruit* ovoid or ellipsoid, about 2 cm. long, 12 mm. broad, shortly beaked.—Description from Rheede's plate.

HABITAT.—Malabar, *Rheede.*

OBSERVATIONS.—It seems allied to *C. travancoricus* from which it differs in the longer leaves with fewer larger and unicostate (?) leaflets, which point different ways; in the more strongly armed leaf-rachis and spadix; and in the larger ellipsoid fruit. As is stated in the *Flora of British India*, I think that a *Calamus* fruit sent from Malabar to Kew by Major Campbell exactly corrresponds to Rheede's figure. This fruit, 20–22 mm. long (without the persistent pedicelliform perianth) and 12–15 mm. broad, is some-what variable in shape, ovoid, broader at the base than above, or ovoid-elliptic, very suddenly contracted at the summit into a short and thick mucro, and is furnished at its base with a short acute caudiculum, which penetrates into the perianth; scales very numerous, in 27 longitudinal series, not channelled along the middle, cinnamon-brown, dusty-puberoulus near their base (under a good lens), with a rather elongate darker chestnut-brown shining not very appressed and not fimbriate tip, the margins very acute not or indistinctly erosely-toothed; *seed* 14–15 mm. long, 9 mm. broad, 5 mm. thick, oblong, flattened, irregularly wrinkled or alveolate, superficially on the surface with an indistinct and superficial chalazal fovea; albumen equable with very superficial intrusion of the integument; embryo basal.

The female flowers, judging from the fruiting perianth, are about 6 mm. long; this forms to the fruit a pedicel of about 4 mm. long, has the calyx campanulate, 3·5 mm. thick, polished in its lower portion (which is immersed in the involucre), with 3 triangular acute teeth; the segments of the corolla, slightly longer than the calyx, opaque and finely striately veined outside.

Rheede (l. c., p. 123) writes that the seed of this *Calamus* dried and powdered "genuum ulcera sanat." Mart. Hist. Nat. Palm. iii, 208, on the authority of Roxburgh, had at first reduced the *Kutu-tsjurel* to *C. gracilis*, but later (l. c. p. 330), following Griffith, has considered it as a distinct species.

Plate 226-III.—Calamus Rheedei *Griff.* Fig. 10, mature fruit; fig. 11, the same fruit ×2; fig. 12, seed, dorsal view, ×1½; fig. 13, seed longitudinally cut through the embryo, ×1½.

101. Calamus Huegelianus Mart. Hist. Nat. Palm. iii, 338 t. z xii, f. 3 (diagr.); Walp. Ann. iii, 488 and v, 831; Hook. f. Fl. Brit. Ind. vi, 452; Becc. in Rec. Bot. Surv. Ind. ii, 207;

C. Wightii Griff. Palms Brit. Ind. 102; pl. ccxvi, c;

C. melanolepis H. Wendl. in Kerch. Les Palm. 237.

Daemonorops melanolepis Mart. Hist. Nat. Palm. iii, 331, pl. 175, f. xi and z xii, f. 4; Walp. Ann. iii, 481 and v, 829. (See also Mart. l. c., p. 342, under *C. dioicus* and pl. 116 f. xi.)

Description.—Scandent, of moderate size. *Sheathed stem* 3 cm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, more or less covered with a greyish-brown scurf, especially abundant in the younger parts, including the spines; densely armed with solitary or approximate and even subseriate flat subulate sublanceolate straight deflexed or slightly hooked spines, which are intermingled with others smaller and very slender, also scattered or subseriate; the largest spines are 10–15 mm. long, their base is broad, swollen above and concave beneath. *Ocrea* very short, coriaceous, truncate. *Leaf-sheath flagella* compressed in their lower portion, where armed with straight slender spines on the edges. *Leaves* rather large, not cirriferrous; petiole green, even when dry, about 25 cm. long; rather stout, almost equally convex on both surfaces, but more underneath where armed along the middle with spines similar to those of the spathes, but gradually transformed into claws upwards; margins rather acute and furnished with unequal spines, solitary or grouped, straight and ascendent or deflexed; rachis acutely bifaced above from near its base, armed below along the middle with a single series of solitary claws; leaflets numerous, equidistant, usually opposite especially towards the summit, narrowly ensiform, somewhat attenuate at the base, very long-acuminate into a bristly penicillate tip, subshining on both surfaces, slightly paler beneath, where quite naked or with a few long bristles scattered along the mid-costa, distinctly 3-carinate above, where the mid-costa is very acute and much more prominent than the side-nerves; these usually more than the central one sprinkled with long or short bristles or more rarely naked; margins acute, very distinctly ciliolate-spinulous; transverse veinlets indistinct; the largest leaflets, up to 70 cm. long but usually 40–50 cm. and 2·5–3 cm. wide; the upper ones smaller; the two of the terminal pair less acuminate than the others, 12–15 cm. long, quite free at the base. *Male spadix* . . . . . *Female spadix* very elongate, terminating in a very strong and excessively long flagellum (3 m., *Griffith*) which is powerfully armed with strong broad-based solitary or variously confluent half-whorled or sometimes nearly completely whorled claws; the axis of the spadix straight, rigid, robust, bearing a few very distant partial inflorescences; lower primary spathes somewhat compressed and two-keeled, more or less armed with straight, short, solitary, more or less horizontal, broad-based spines; upper primary spathes very elongate, some of them up to 40 cm. long, coriaceous, almost polished, tubular, closely sheathing, subcylindraceous or obsoletely angular-compressed, obliquely truncate and entire at the mouth, slightly prolonged at one side into a short acute point, this keeled on the back, attenuated for a considerable length at the base, more or less densely prickly on the outer side lower down, and like the lower ones all round in their upper part; partial inflorescences erect, rigid, rather densely panicled-pyramidate, the largest 20–30 cm. long with 5–7 gradually diminishing spikelets on each side, their axis rigid, slightly zig-zag sinuous; secondary spathes shortly tubular-infundibuliform, obliquely truncate, entire and ciliolate at the mouth, more or less prolonged at one side into a triangular acute or acuminate point; spikelets rigid, arched, spreading or subhorizontal, distichous, inserted just at the mouth of their respective spathes with a distinct axillary callus and transversal rima, the lowest, the largest 5–7 cm. long, with 6–8 slightly secund flowers on each side, or with the two series of flowers pointing upwards and not spreading in one plane; uppermost spikelets very few-flowered; spathels shortly infundibuliform, horizontally truncate, acute at one side; involucrophorum more or less distinctly pedicelliform, especially in the lower part of the spikelet, exsert from its own spathel and attached laterally at the base of the one above with a distinct axillary callus next to the axis, expanded at the summit into a shallow truncate entire subcalyculiform limb; involucre slightly concave, orbicular, subdiscoid-pateriform, with entire or unequal margin; areola of the neuter flower callous with a central punctiform scar and sometimes subpedicelliform. *Female flowers* rather large, 6 mm. long, ovoid-acute when in bud; the calyx coriaceous, campanulate, smooth or faintly veined outside, shortly and acutely 3-toothed; the corolla almost twice as long as the calyx, its segments thick, ovate or ovate-lanceolate, acute, polished outside; stamens united by their bases, triangular in the free portion. *Fruiting perianth* rather thick, shortly pedicelliform. *Fruit* almost sphaeric or slightly turbinate, 15–18 mm. in diam., very suddenly contracted into a short conic beak and crowned by the persistent reflexed stigmas; scales in 21 series, shining; quite black or sometimes of a chestnut-brown colour or more rarely spadiceous near their base with a much darker tip and margins, not or very indistinctly channelled along the middle, longer than broad with a rather elongate triangular not very adpressed or subsquarrose point; this and the margins distinctly erosely toothed. *Seed* globular, 11–13 mm. in diam., covered with the very adherent opaque granulate integument; albumen deeply and subradiately ruminate, chalazal fovea indistinct, embryo basal.

HABITAT.—Lower India. The type-specimens were collected in December 1850 by Wight (No. 2760) at Sisparah (Herb. Kew and St. Petersb.) in the Nilghiri mountains, where it seems a rather common plant, having been found again by Gamble on the Sisparah Ghat (1,200 m.), at Conoor (1,500–1,800 m.) and at Naduvatam (1,800 m.).—Hügel's specimen in Martius's Herbarium at Brussels has no special locality on the label.

OBSERVATIONS.—This species has received three names according to the degree of development of the flowers or fruit. Martius gave the name of *C. Huegelianus* to the female plant in flower, and that of *Dæmonorops melanolepis* to that with immature fruit, and Griffith that of *C. Wightii* to that with full grown fruit. Moreover it seems to me almost certain that the fruit figured by Martius in the plate 116, f. xi, and of which mention is made after the diagnosis of *C. dioicus*, belongs also to *C. Huegelianus*.

Dæmonorops melanolepis is the first name given to the present species, but as this cannot remain in the genus *Dæmonorops*, I have adopted the name of *C. Huegelianus* published at an earlier date than that of *Wightii*. Griffith has not left a description of *C. Wightii*, and this name figures in his large posthumous work in the plate ccxvi, C (a reproduction of Dr. Wight's drawing) with the sole indication:—"This species which was received from Dr. Wight is distinguished from all the foregoing by the secund arrangement of the fruit." In that plate are also represented the male flowers which I have not seen.

Of the authentic specimens of *C. Wightii* I have seen one in the St. Petersburg Herbarium and another in that of Kew, where they were unnamed, but evidently they are portions of the same specimen employed in the preparation of the plate quoted above. Of *C. Hugelianus* and of *D. melanolepis* I have also seen portions of the authentic specimens of Martius kindly forwarded to me by the Director of the Botanical Garden at Brussels, and I am therefore quite sure that the three mentioned names are synonymous.

In some of Gamble's specimens the immature fruit has spadiceous scales with chestnut-brown margin and tip, but only in this do they differ from the type, which has the fruit scales black even when in a very young stage.

In some fruits of the St. Petersburg specimen, somewhat larger than usual, I have found two seeds flat where in contact and convex on the outer side.

The diagnostic notes of *C. Huegelianus* are the long leaves with equidistant numerous narrowly ensiform 3-costate leaflets; the long rigid spadix with a very long and very powerfully clawed flagellum, and few partial rigid pyramidate scorpioid inflorescences; the arched spreading spikelets, with a secund arrangement in the flowers and fruit; the round fruit with very dark not channelled scales; the round ruminated seed.

PLATE 122.—Calamus Huegelianus *Mart.* Portion of the fruit spadix and leaf-sheath flagellum; detached seeds, one cut in two halves across the embryo.—From Wight's specimen in the St. Petersburg Herb.

102. CALAMUS GAMBLEI Becc. in Hook. f. Fl. Brit. Ind. vi, 493, and in Rec.. Bot. Surv. of Ind. ii, 207.

DESCRIPTION.—Very probably scandent and of moderate size. *Stem* . . . . *Leaf-sheaths* . . . . . *Leaves* large, non-cirriferous; petiole . . . . . ; rachis finely striolate longitudinally, bifaced above and rounded beneath in its intermediate portion where it is armed along the middle with small solitary claws; leaflets numerous, rather remote (6–7 cm. apart), firmly papyraceous, green even when dry, slightly paler beneath than above; elongate-ensiform or narrowly lanceolate-ensiform, 60–65 cm. long, 25–28 mm. wide, somewhat narrowed to and gradually plicate at the base and gradually attenuated from not very far above the base into a long subulate-acuminate bristly-ciliate tip, with 3 distinct costae, of which the central one a good deal more raised and acute than the side ones, all more or less furnished at least from the middle upwards, with a few remote subspiny brown bristles; on the under surface the 3 costae also sparsely bristly, but the central one slightly prominent and the side ones very slender; transverse veinlets rather sharp and much interrupted; margins remotely ciliate-spinulous. *Male spadix* . . . . . *Female spadix* not seen entire; simply decompound; partial inflorescences 25–30 cm. long, somewhat arched, their axis slightly zig-zag sinuous and obsoletely trigonous, with 7–8 distichous spikelets on each side; primary spathes . . . . .; secondary spathes unarmed, at first furfuraceous, speedily glabrous and subshining, tubular-infundibuliform, very closely sheathing, obliquely truncate and entire at the mouth and prolonged at one side into a short acute point; spikelets spreading, arched and recurved from an ascendent base, distinctly callous at their insertion, the largest, the lowest, 8–10 cm. long, with 8–9 flowers on each side, the upper ones gradually shorter, the extreme 15–20 mm. long with 3–5 flowers only; spathels cylindraceous in their lower portion, rather suddenly infundibuliform upwards, acute or apiculate at one side; involucrophorum inserted outside its own spathel at the base of the one above, distinctly pedicelliform, 1–4 mm. long, conspicuously callous at its axilla next to the axis, expanded at its apex into a small truncate, entire calyculiform limb; involucre discoid-pateriform, almost flat, subtrigonous with entire margin; areola of the neuter flower represented by a small projecting tubercle, often pedicelliform. *Female flowers* in two series, both pointing upwards or secund, ovate, 5 mm. long; the calyx subcampanulate, coriaceous, smooth not veined outside, with 3 very short and very broad acute teeth; the corolla about one-fourth longer than the calyx, divided down about to the middle into 3 broad triangular acute thick polished segments; the stamens with the filaments united by their bases, forming a cup as long as the undivided portion of the corolla and crowned by 6 short teeth; anthers sagittate, as long as the segments of the corolla; ovary ovate; style obsolete; stigmata thick trigonous erecto-divergent. *Fruiting perianth* pedicelliform, thick and callous, about 3 mm. long. *Fruit* globose, obpyriform or turbinate-globose, slightly tapering towards the base, where caudiculate, flattish on the top, where very shortly mucronulate, 22–25 mm. long, 17–18 mm. broad; scales usually in 21 series, somewhat longer than broad, strongly gibbous, rather deeply channelled along the middle, shining, pale yellow, with a narrow almost black marginal line, prolonged into a triangular rather acute adpressed point, not fimbriate and like the margin finely erosely-toothed. *Seed* regularly globose ovoid, rounded at both ends, about 13 mm. long and 11 mm. broad, deeply ruminate, covered with the very adherent opaque granular integument; embryo basal.

HABITAT.—Lower India. Nilghiri Hills in the Makurti forest at about 1500 m. above the level of the sea, *J. S. Gamble*, June 1884, with mature fruit.

OBSERVATIONS.—I have seen of this an intermediate portion of a leaf with a few leaflets and a few detached partial inflorescences with female flowers and mature fruit.

A very handsome species related only to *C. Huegelianus*, from which it differs in the sub-obpyriform fruit with rather deeply channelled scales which have a narrow very dark marginal line and an adpressed, very finely erosely toothed point. Some other specimens in the Herbarium at Kew, which probably belong to this species, have the leaf with numerous equidistant leaflets. One male spadix is ultradecompound recalling much that of *C. acanthospathus*, with long, 15 mm. broad, tubular closely sheathing spathes, armed with broad-based straight horizontal spines; the partial inflorescences arise erect from inside their respective spathes, then are arched with many gradually diminishing branchlets.

PLATE 123.—Calamus Gamblei *Becc.* An intermediate portion of a leaf; partial inflorescence with female flowers after fertilisation; partial inflorescence with mature fruit, from Gamble's type-specimen in Herb. Kew. Summit of an inflorescence of the var. *sphaerocarpus* with mature fruit, one seed entire and one longitudinally cut through the embryo, from Wight's specimen in Herb. Kew.

CALAMUS GAMBLEI *var.* SPHAEROCARPUS Becc. l. c.

Fruit spherical, not tapering to the base, 18 mm. in diam.; *seed* also almost spherical.

HABITAT.—Nilghiri Hills, Wight in Herb. Kew; collected also by Gamble in the same locality.

103. **CALAMUS GRACILIS** Roxb. Fl. Ind., iii, 781 (excl. *Tsjeru-tsjurel* Rheede, Hort. Mal., xii, t. 64); Mart. Hist. Nat. Palm. iii, 210 (1s. edit.) and 338; Kunth Enum. Pl. iii, 209; Griff. in Calc. Journ v, 54 and Palms Brit. Ind. 64, t. CXCVI; Walp. Ann. iii, 488, and v, 831; Kurz. in Journ. Asiat. Soc. Beng. xliii (1874), II 212 t. XXXIV C and Forest Fl. Brit. Burma, ii. 520; Hook. f. Fl. Brit. Ind. vi, 453; Becc. in Rec. Bot. Surv. Ind. ii, 208. (*C. gracilis* Blanco, vede *C. Blancoi* Kunth. *C. gracilis* Thw. Enum. Pl. Zeyl., vide *C. pachystemonus* Thw.)

DESCRIPTION.—Slender, scandent. *Sheathed stem* 15–20 mm.; naked canes 10–12 mm. in diam. *Leaf-sheaths* green even when dry, more or less densely covered with a fugacious and detachable dark furfuraceous scurf, not distinctly gibbous above, obliquely truncate and smooth at the mouth, very sparsely armed with very short solitary horizontal or slightly ascendent semiconic black-tipped broad-based prickles; sometimes almost smooth. *Leaf-sheath flagella* elongate, slender, flattened and almost unarmed in their basal portion. *Ocrea* indistinct. *Leaves* not cirriferous, rather short (50–60 cm. long); petiole very short (1–3 cm. long), obsoletely trigonous, flat above, or almost obsolete; rachis acutely bifaced and smooth above, irregularly armed beneath along the middle in its basal portion and also at the sides with solitary claws; leaflets few, all in one plane (not pointing in different directions), approximate into 3–4 usually opposite groups of 3–5 on each side of the rachis, each group separated by a long (10–15 cm.) vacant space, thinly chartaceous or subherbaceous, green even when dry, concolorous or barely paler beneath than above, narrowly oblanceolate or elliptic-lanceolate, gradually attenuate to the base and from or a little above the middle acuminate into a subulate bristly-ciliate tip; very finely 3–5 and even 7-costulate; the mid-costa scarcely stronger than the two next, those nearer to the margins more slender, all spinulous above, on the under-surface the mid-costa only sparingly spinulous near the summit, the others slender and naked; transverse veinlets very short, rugulose; margins inconspicuously adpressedly spinulous; the largest leaflets, those of the intermediate groups, 20–25 cm. long. 20–25 mm. broad, the lowest somewhat narrower but not shorter, those of the terminal group (4 or 6) slightly shorter and broader than the intermediate ones; the two of the terminal pair more or less united by their bases; the leaves of young plants have the petiole longer, the rachis more rusty-furfuraceous, the leaflets longer, narrower and with only three spinulous costae and the fascicles formed by a greater number of leaflets, sometimes as many as eight pairs. *Male spadix* ultradecompound in its lower portion, simply decompound upwards, slender, 80 cm. to 1·2 m. long, ending in a filiform, feebly clawed flagellum; primary spathes tubular, closely sheathing, entire, thinly coriaceous; the lowest shorter than the upper ones (8–10 cm. long), truncate at the mouth, slightly compressed, faintly two-keeled, sparingly armed with very small claws; upper primary spathes cylindraceous, obliquely truncate at the mouth and prolonged more or less into a triangular acute or acuminate point, quite smooth or sparingly aculeolate, suddenly narrowed in their lower axial portion, where flat on the inner side, convex externally and with acute margins; partial inflorescences few (3–6 very distant, arching-patent; the uppermost with 1–3 spikelets only; the lowest 10–15 cm. long, with few branchlets at the base and a few simple spikelets in their upper part; secondary spathes unarmed, minutely hairy-furfuraceous, narrow, tubular-infundibuliform, obliquely truncate, entire and acute at one side at the mouth; spikelets 2–4 cm. long, slender, inserted above the mouth of their own spathe, spreading or horizontal, with a distinct axillary callus; spathels suddenly broadly infundibuliform from a narrow base, with an acute patent or deflexed striately-veined point; involucre calyculiform, slightly concave, striately veined; acute right and left. *Male flowers* relatively large, oblong and acute in bud, 5 mm. long, 2 mm. thick; the calyx tubular-campanulate, striately veined, teeth short, broadly triangular, acute; corolla twice as long as the calyx or even longer, its segments lanceolate, acute, finely striate. *Female spadix* decompound, relatively short, subflagelliform, 60 cm. to 1·2 m. long, distinctly callous at its insertion, rather rigid, erecto-patent at first, then nodding, ending in a slender feebly-clawed flagellum, with 5–9 partial inflorescences; primary spathes as in the male spadix, the lowest 6–7 mm. thick, the upper often more densely clawed than the lower ones; partial inflorescences 5–9, rather distant (8–15 cm. apart), rather rigid; the lowest, the largest, 10–15 cm. long, with 3–5 gradually diminishing spikelets on each side, these inserted at or a little above the mouth of their respective spathes, with a distinct callus and transversal rima at their axilla; upper inflorescences shorter, the terminal reduced to a small solitary spikelet; secondary spathes elongate, tubular-infundibuliform, obsoletely angular, truncate, ciliolate and acute at one side at the mouth, fugaciously rusty-furfuraceous and scabridulous; spikelets 3–5 cm. long, the lower ones, the largest, with 5–7 distichous flowers on each side; spathels tubular-infundibuliform, more distinctly scabrid than the secondary spathes, truncate, entire and acute at one side at the mouth; involucrophorum exsert from its own spathel and laterally attached to the base of the one above, almost flat, disciform, slightly projecting and apiculate on the side of the neuter flower; involucre orbicular, disciform-pateriform or almost explanate, the margin often unequal or undulate; areola of the neuter flower depressed, sublunate with a central callous scar and rather sharp borders. *Female flowers* distant, horizontally attached, 3·5 mm. long; the calyx shortly cylindraceous, thick and coriaceous, almost smooth or obsoletely veined, shortly 3-toothed; corolla deeply parted into three ovate-acute segments, slightly longer than the calyx; stamens with filaments highly connate at the base and broadly triangular in the free portion; anthers sagittate. *Fruiting perianth* distinctly pedicelliform with a flat base. *Fruit* broadly ovoid-elliptic, equally rounded at both ends, caudiculate at the base, very suddenly and shortly mucronate at the summit, 25–30 mm. long including the perianth and the beak, 14–17 mm. broad; scales in 21 series, straw-yellowish, usually concolorous or with a very narrow brown border, shining, narrowly but rather deeply channelled along the middle throughout their total length, and giving the fruit the appearance of being longitudinally channelled with as many furrows as there are series of scales. *Seed* almost regularly ovoid, rounded at both ends, 16–18 mm. long, 12–14 mm. broad, 10–11 mm. thick, covered by the very adherent integument, finely pitted, with a small central superficial chalazal fovea on the raphal side; albumen very deeply ruminate, or penetrated almost to the centre with narrow channels filled with a substance of the appearance of coagulated blood; embryo central on the face opposite to the chalazal fovea and deeply penetrating the albumen.

HABITAT.—N. E. India: Chittagong, *Roxburgh;* Khasia Hills in the Ladder valley, 1,000 m., and at Churra 1,200 m. *Hooker & Thomson* in Herb. Kew; Cachar, *R. L. Keenan* in Herb. Kew; Upper Assam, on the banks of the Dhunsiri River, *G. Mann* in Herb. Kew; Doyan forest and Naga Hills, *Mann* in Herb. Becc.—Native name in Chittagong, "Mapuri Bet" (Roxburgh), in Assam "Oahing Bet" (G. Mann).

OBSERVATIONS.—This is a very distinct species by its short leaves with lanceolate, conspicuously grouped leaflets, which do not point in different directions but are arranged in one plane, those of one side opposite to those of the other side and the groups separated by long vacant spaces; furthermore very few *Calami* have the seed ruminated with the embryo in the centre of one of the faces and not basal. In fruit it approaches *C. melanacanthus*, but this has leaves with numerous equidistant leaflets.

I have described the male spadix from some specimens sent by Wallich to the botanic garden of Copenhagen.

PLATE 124.—Calamus gracilis *Roxb.* Upper portion of a leaf-sheath with base of a leaf and of a spadix; upper portion of a leaf; the spadix, of which the base is attached to the sheath—it bears ripe fruit; one seed seen from the raphal and another from the embryo side; one transversally and one longitudinally cut through the embryo.—From Mann's specimens from the Khasia Hills, in Herb. Becc.—One fruit-spadix with the terminal cirrus, on the left side of the plate, from the Dayan Forest (Mann in Herb. Becc.).

104. CALAMUS MELANACANTHUS Mart. Hist. Nat. Palm. iii, 211 (1st edit.) and 333, t. 116, f. 3 and t. Z XXII, f. X; Kunth, Enum. Pl. iii, 211; Griff. in Calc. Journ. Nat. Hist. 49 and Palms Brit. Ind. 59; Walp. Ann. iii, 484 and v, 830; Miq. Fl. Ind. Bat. iii, 115 and De Palmis Arch. Ind., 27; Kurz in Journ. Asiat. Soc. Beng. xlii, II. (1874), 215, t. XX B; Hook. f. Fl. Brit. Ind. vi, 453; Becc. in Rec. Bot. Surv. Ind. ii, 208.

DESCRIPTION.—Scandent. *Stem* . . . . . . *Leaf-sheaths* . . . . . . *Leaves* elongate, not cirriferous; petiole . . . . . ; rachis in its upper portion bifaced above and armed beneath with small solitary claws; leaflets numerous, regularly bifarious, equidistant, alternate or subopposite, nitescent, green even when dry, almost concolorous on both surfaces, linear-lanceolate, somewhat narrowed to the base, gradually acuminate into a very slender filamentose tip, tricostulate, the mid-costa very sparingly bristly-spinulous on both surfaces, the other two costae furnished with a few long bristles in the upper surface and naked beneath; transverse veinlets slender and distant and much interrupted; margins acute, furnished with very minute distant spinules, these closer near the summit; the largest leaflets, which are the lowest in one specimen of the upper part of a leaf, 17–18 cm. long and 10–11 mm. broad, very speedily diminishing towards the summit, where they are of the size and shape of willow leaves, almost obtuse and bristly at their apex; the two of the terminal pair shortly connate at the base, 4·5 cm. long and 5 mm. broad. *Female spadix* apparently very long and flagelliform with remote partial inflorescences and elongated axial portions, these armed on their convex outer side with strong solitary or aggregate dark-tipped claws; upper primary spathes very elongate, very narrowly tubular, cylindraceous, thinly coriaceous, very closely sheathing, green even when dry, not or indistinctly longitudinally striate, smooth in their upper part, obliquely truncate, entire and acute at one side at the mouth; partial inflorescences inserted outside the mouth of their own spathes, callous at their upper axilla, the only one seen by me 20 cm. long, erecto-patent with a rather rigid axis, loosely panicled, bearing 5 distichous spikelets on each side secondary spathes tubular, cylindraceous, very slightly enlarged in their upper part, very closely sheathing, obliquely truncate at the mouth, acute at one side, ciliate at the margin, unarmed, fugaciously squamulose and later glabrous; the lowermost obsoletely angular; spikelets spreading or horizontal, inserted above the mouth of their town spathes, the lowest, the largest, 5–6 cm. long, with 6–7 alternately distichous rather remote flowers on each side; spathels shortly tubular, cylindraceous, slightly enlarged above, truncate and ciliate at the mouth, subacute at one side; involucrophorum exsert from its own spathel and laterally attached to the base of the one above, almost flat, subdiscoid with a very narrow limb; involucre very shallow, subdiscoid-pateriform, slightly exceeding the involucrophorum, its margin entire or obsoletely toothed; areola of the neuter flower distinctly depressedly lunate. *Fruiting perianth* very distinctly pedicelliform, 3 mm. long, the calyx hardened, cylindraceous, about 3 mm. thick, not veined outside, teeth short very broadly triangular, acute; the corolla divided down almost to the middle into 3 ovate-lanceolate acute smooth (not veined) segments, slightly longer than the calyx; stamens with filaments highly united by their bases, shortly dentiform in the free portion. *Fruit* ovoid-elliptic, 23–25 mm. long, 14–15 mm., broad, suddenly mucronate-mammillate at the summit, caudiculate at the base; scales in 18 series, regularly rhomboid, about as long as broad and not prolonged at the apex, almost obtuse, rather opaque, channelled along the middle, straw-yellowish, bordered all round with a very narrow very dark line; margins very finely erosely toothed. *Seed* oblong, rounded at both ends, 16 mm. long, 7 mm. thick, somewhat compressed, rather deeply ruminate; embryo lateral, in the centre of one of the faces.

HABITAT.—On the Tenasserim coast at Chappedong, *Wallich* No. 8606 B in Herb. Kew.

OBSERVATIONS.—Martius has given the name *C. melanacanthus* to the specimens distributed by Wallich with the No. 8606 A, B. But two very distinct species are represented under this number.

The specimens No. 8606 bearing the letter A and doubtfully said to come from Penang seem to me to belong to *C. Diepenhorstii*; while to those with the letter B from Chappedong I have kept the name of *C. melanacanthus*, as Martius has figured one fruit of these very specimens in the plate 116, f. 13.

The specimen seen, described and figured by me is one with Wallich's No. 8606 B, preserved in the Herbarium at Kew; it consists of the upper portion of a leaf and of a portion of the female spadix with only one partial inflorescence and a few almost mature fruits.

It appears a very distinct species, by its elongate leaves with narrowly lanceolate numerous equidistant leaflets, elongate female spadix, elliptic fruit, ruminate seed, and lateral embryo.

This species on account of the position of the embryo approaches *C. gracilis*, but this has inequidistant fascicled leaflets. In *C. Diepenhorstii* the embryo is at the base of the seed.

PLATE 125.—Calamus melanacanthus *Mart.* Upper portion of a leaf and portion of the fruit-spadix; one seed longitudinally cut through the embryo; portion of the surface of the fruit enlarged; from Wallich's No. 8606 B in Herb. Kew.

105. CALAMUS DIEPENHORSTII Miq. in Journ. de Bot. Neerl. i, 21, and Prodr. Fl. Sum. 594 and De Palmis Arch. Ind. 27; Hook. f. Fl. Brit. Ind. vi, 454; Becc. in Rec. Bot. Surv. Ind. ii, 208.

DESCRIPTION.—High scandent, slender or of moderate size. *Sheathed stem* 1·5–3 cm. in diam., internodes 20–25 cm. long. *Leaf-sheaths* sometimes flagelliferous, slightly gibbous above or furnished under the petiole with 1–2 transverse not very prominent wrinkles, more or less densely armed with flat, thinly laminar, broad, sublanceolate, 1–2 cm. long, elastic, black, horizontal or slightly deflexed solitary or seriate spines, which have fringed furfuraceous margins and a callous swollen light base, this with a sharp line of demarcation from the black lamina. *Ocrea* in leaves of adult plants very short. *Leaf-sheath flagella* very long but relatively feebly clawed, with their basal spathe more or less flattened and two-edged, the edges armed with straight horizontal short spines, the faces smooth or prickly. *Leaves* not cirriferous, elongate, ·7–1·4 m. long; petiole rather robust and long (30 cm. and sometimes even more), channelled near its base, otherwise flat and smooth above, its margins acute and armed with black-tipped rather closely set claws which extend to the sides of the first portion of the rachis; rounded beneath where armed, especially along the middle, with similarly black-tipped solitary claws, which pass unchanged but more approximate and decreasing in size through the whole length of the rachis; in its upper surface the rachis is smooth and not very acutely bifaced; leaflets numerous, rather closely set, equidistant, alternate, narrow and elongate or linear-ensiform, attenuate at the base, long-acuminate into a very slender and subulate tip, thinly papyraceous, subconcolorous on both surfaces, unicostate; the mid-costa acute and raised above, where sprinkled from the middle upwards with a few bristles; secondary nerves all smooth above, one of these on each side of the mid-costa sometimes slightly stronger than the others; on the undersurface the mid-costa and one nerve on each side of it furnished with long black conspicuous bristles; margins slightly thickened by a secondary nerve, ciliate near the apex with a few black approximate bristles, otherwise smooth (not spinulous or ciliate); transverse veinlets slender; the largest leaflets, the mesial, 35–38 cm. and in very robust leaves even 45 cm. long, 15–18 mm. broad, the upper ones gradually shorter, the two of the terminal pair free at the base, very narrow, 12–15 cm. long. *Male spadix* very long, slender and lax, ultradecompound, 2–3 and more metres in length, strongly armed in the very long axial portions between two partial inflorescences with scattered or half-whorled, very acute, black-tipped claws, which rest on a light-coloured base; primary spathes thinly coriaceous, tubular, closely sheathing, fugaciously furfuraceous, thinly coriaceous; the lowest more or less flattened, two-edged, narrow, very long, entire and truncate at the mouth, the edges armed with short horizontal or deflexed spines, the faces smooth, or prickly in vigorous specimens; upper primary spathes excessively long, up to 60–70 cm., cylindraceous, truncate at the mouth where sometimes split longitudinally, usually sparingly clawed in their upper part; partial inflorescences few, very remote, very long (40–60 cm.), lax, slender, with a few simple spikelets at their summit and a good many secondary branches near their base; these 8–10 and in vigorous specimens 15–20 cm. long, each branchlet with 4–5 spikelets on each side; branches, branchlets and spikelets provided with a distinct axillary callus and a transversal rima at their insertion; secondary spathes unarmed, very narrowly tubular, slightly enlarged in their upper part, very narrow at the base, where flat on the inner side, obliquely truncate at the mouth, slightly prolonged at one side into a short triangular point, this keeled on the back; spikelets horizontal or more or less deflexed, inserted just above the mouth of their own spathes, 1–3 cm. long with 5–12 flowers on each side; spathels very short and closely packed, furfuraceous, very broadly and shallowly infundibuliform, more or less distinctly striately veined, embracing the involucre, with an erect subobtuse point on the outer side; involucre cupular, rather deep, enclosed in the spathel, truncate and entire at the margin, posticously flat and acutely two-keeled. *Male flowers* distichous, approximate, inserted at an angle of 45°, ovate, about 3 mm. long, rather blunt; the calyx tubular, cylindraceous, strongly striately veined, teeth broad; the corolla polished outside, one-third longer than the calyx. *Female spadix* usually simply decompound, occasionally ultra-decompound, of very variable size, but always very long; in one specimen it measured 5 metres, including a long terminal flagellum; in delicate individuals it attains 2–3 metres; partial inflorescences as in the male spadix very elongate, the largest with 5–7 distichous very remote horizontal or deflexed spikelets on each side; when the spadix is supra-decompound in the place of simple spikelets there are some branchlets bearing 4–5 small few-flowered spikelets on each side; common spikelets 4–12 cm. long, callous at their insertion, their axis rather rigid, subcylindraceous, flexuous, with 4–10 alternately distichous distant flowers on each side; spathels short, infundibuliform, truncate, acute or apiculate at one side; involucrophorum almost entirely exsert from its own spathel, obliquely attached to the base of the one above, cupular, rather deep, truncate, entire, involucre moulded on the involucrophorum and slightly exceeding this, rather deep, truncate, entire; areola of the neuter flower almost circular, concave and rather deep, sharply bordered. *Female flowers* inserted at a wide angle or subhorizontal, ovate, obtuse, 3 mm. long; the calyx shortly 3-toothed, thick and callous at the base; the corolla divided almost to the base into 3 half-ovate acute segments; stamens forming by their connate base an urceolum which is crowned by 6 very short teeth; anthers ovate, acute. *Neuter flowers* smaller than the female ones, speedily deciduous. *Fruiting perianth* with the calyx callous at its base, more or less irregularly split and nevertheless forming a short pedicel to the fruit. *Fruit*, when full grown and perfectly ripe, round, 16–18 mm. in diam., shortly mucronulate; scales in 18–24 series, rhomboid, broader than long, slightly lengthened into an obtuse apex, superficially channelled along the middle, rather opaque, light yellowish with a very narrow darker intramarginal line and very narrow hyaline finely erosely toothed margins. *Seed* globular, 10–12 mm. in diam., deeply pitted on the surface; albumen deeply ruminate; embryo basal.

HABITAT.—Sumatra: west coast in the Prov. of Priaman, *Diepenhorst* fide Miquel; in the Prov. of Padang at Sungei-bulu, *Beccari* P. S. No. 907. The Malayan Peninsula: on the Gunong Tambang Batak near Perak, at 1000–1300 met. *Scortechini* No. 647^b in Herb. Becc.; in the same district on Gunong Malacca, Herb. Calc. No. 7201 and *Ridley* No. 9815; at Pankor (male plant), *Ridley* No. 7898 and at Lumut Dending, *Ridley* No. 10241; in Selangore at Genting Bedai, *Ridley* No. 7892; Pinang, at Muka Head, *Curtis* No. 765 in Herb. Kew. : Borneo?, *Lobb* No. 9 in Herb. Calc..

Malay name "Rignon" (Scortechini); "Rotang Chichi" (Ridley).

OBSERVATIONS.—Of *C. Diepenhorstii* I have seen a portion of the authentic specimen with mature fruit, which perfectly agrees with my No. 907 of the "Plantae Sumatranae." I have been also able to establish that No. 8606 A of Wallich belongs to *C. Diepenhorstii* and not to *C. melanacanthus* (see observations on this species).

The diagnostic characters of *C. Diepenhorstii* are the leaf-sheaths armed with spines which have a broad lanceolate fringed black lamina and a swollen light base; the numerous 1-costate narrow elongate equidistant leaflets with smooth margins and usually with 3 bristly nerves beneath; the very elongate spadices; the round fruit with light-yellowish scales; the round deeply ruminate seed and basal embryo.

It is a very variable plant as to the size of the fruit, the number of its scales, the dimensions and degree of branching of the spadices. The leaflets have usually 3 bristly nerves beneath, but in Lobb's specimens from Borneo, the mid-costa only bears bristles on both surfaces. This specimen, if it really comes from Borneo, represents perhaps a local form, as, after mature examination, I now consider *C. singaporensis*, which has the leaflets with all its nerves naked beneath, to be.

The specimen No. 7201 from Gunong Malacca has a partial inflorescence which instead of simple spikelets bears branchlets which have 4–5 very small secondary spikelets on each side; the fruit, which is not perfectly mature, is globose-ovoid, with scales in 18 series. In my specimens No. 907 from Sumatra the scales are in 24 series.

PLATE 126.—Calamus Diepenhorstii *Miq.* Portion of the sheathed stem of a very robust individual; an intermediate portion of a leaf (under surface); portion of a female spadix with flowers just after fertilisation,—the above from Scortechini's No. 647 in Herb. Becc. A partial inflorescence of a supradecompouud spadix with immature fruit, from No. 7201 in the Calcutta Herb.; mature fruits and seeds, one of these longitudinally cut through the embryo, from Beccari's P. S. No. 907.

CALAMUS DIEPENHORSTII var. SINGAPORENSIS Becc.

C. singaporensis Becc. in Hook. f. Fl. Brit. Ind. vi, 454, and in Rec. Bot. Surv. Ind. ii, 208.

DESCRIPTION.—Leaflets as in the type but with the mid-costa naked on both surfaces or sometimes with a few straggling bristles above; the secondary nerves naked on both surfaces.

HABITAT.—Singapore: in the wild part of the Botanic Garden, *H. J. Murton* No. 126 in Herb. Kew.: and in the State of Johore in the Malayan Peninsula at Kowala Tebing tingi, *Ridley* No. 11200 in Herb. Berol. and Kew.

OBSERVATIONS.—The male spadix which accompanies the leaf in Murton's specimens has the spikelets with spathels which exceed the involucres, while in the type usually the point of the spathels is on a level with their respective involucre; the young male flowers in the var. *singaporensis* are covered with brown and silvery scales.

The abovementioned Lobb's specimen No. 9 of the Calcutta Herb., said to come from Borneo, might probably also be considered as belonging to a distinct variety. This specimen is of the base of a leaf with portion of the sheath and a male spadix which in no way differs from the corresponding portion of spadix of the Malayan specimens. The leaf-sheath has the characteristic black spines with light base but the leaflets only bear a few long bristles on the mid-costa of both surfaces.

PLATE 127.—Calamus Diepenhorstii *var.* singaporensis *Becc.* Basal portion of a leaf (under surface); basal portion of a male spadix with an entire partial inflorescence.—From Ridley's No. 11200 in Herb. Kew.

106. CALAMUS MARGINATUS Mart. Hist. Nat. Palm. iii, 342; Walp. Ann. iii, 491, and v, 832; Miq. Anal. Bot. Ind. 6 and Fl. Ind. Bat. iii, 138 and De Palmis Arch. Ind. 29. H. Wendl. in Kerch. Les Palm. 237; Becc. in Rec. Bot. Surv. Ind. ii, 208.

Daemonorops? marginatus Bl. Rumphia iii, 24.

DESCRIPTION.—Scandent. *Sheathed stem* 20–25 mm. in diam. *Leaf-sheaths* flagelliferous short thick and almost woody, gibbous above under the petiole, very obliquely truncate and open a long way down on the ventral side at the mouth, where naked at the margins, the surface armed with horizontal or slightly deflexed, rather strong solitary or confluent or even transversely seriate spines, which leave a deep depression above them and are of various sizes, the largest being 2·5 cm. long, greenish-brown, paler at the apex than at the base, where flat beneath and slightly gibbous above. *Leaf-sheath flagella* very long (in one specimen 2·5 m.), very slender, flattened, two-edged and naked in their lowest portion, armed upwards with rather regularly set half-whorls of moderately strong black-tipped claws. *Leaves* not cirriferous, in one specimen 1·2 m. in length, including the petiole; this 25 cm. long, narrowly channelled above, very convex and smooth beneath along the middle but armed at the sides with variable (from a few mm. to 3 cm. in length) broad-based horizontal rigid spines; rachis in its lower surface round at first, and almost flat upwards where armed with black-tipped slightly hooked claws, these 12–20 mm. apart one from the other, with an acute salient angle above, where smooth and not spinulous and with the side-faces rather concave; leaflets very numerous, equidistant, very regularly set, inserted at an angle of 45,° 15—18 mm. apart, alternate or subopposite, green, almost shining above, barely paler beneath, thinly papyraceous, rigidulous, linear-lanceolate or linear-ensiform, narrowed to the base and a good deal more gradually acuminate at the summit into a very slender and acute bristly-penicillate tip, furnished above with 3 rather distinct and smooth (not bristly or spinulous) costae of which the mesial is the strongest; beneath, the costae more slender than above and very densely covered with small fulvous spinules; the entire surface minutely longitudinally striate by very fine veinlets; the margins quite naked but distinctly thickened by a rather strong nerve and in their lower surface very finely scabrid or shagreened when seen under a lens; transverse veinlets especially visible on the upper surface; the largest leaflets, those of the lower third part of the rachis, 25–26 cm. long and 13–15 mm. broad, the lower ones a good deal narrower, those near the summit shorter and less acuminate; the two of the terminal pair very small, free at the base.—Other parts unknown.

HABITAT.—South Borneo near Martapora on the River Dusson, *Blume;* N. W. Borneo in Sarawak near Kuching, *Beccari* P. B. No. 1906.

OBSERVATIONS.—The above description is taken from the specimen collected by me in Sarawak, but the species was established by Blume on a single leaf of which I have seen a portion and which perfectly agrees with the corresponding portion of my specimen; only the leaflets in Blume's specimen are a little larger (40–43 cm. in length and 2 cm. wide) but otherwise identical.

Though seen only in a sterile condition, this *Calamus* appears fairly characterized by its leaf-sheaths opened above a long way down on the ventral side; by the deep depressions left upon them by the spines; by the petiole smooth beneath and narrowly channelled above; by the 3-costate leaflets, the costae naked above and finely densely spinulous beneath, and chiefly by their thickened and in the lower surface finely scabrid margins.

In the absence of the spadices it is difficult to point out the affinities of this species, which however resembles to a certain extent *C. Diepenhorstii.*

PLATE 128.—Calamus marginatus *Mart.* Portion of the sheathed stem with the base of a leaf and a cirrhus; the summit of a leaf; a detached leaflet seen from the upper surface.—From Beccari P. B. No. 1906.

107. CALAMUS CILIARIS Bl. in Roem. et Schult. Syst. Veg. vii, 2, 1330; Mart. Hist. Nat. Palm. iii, 212 1st edit. and 334; Kunth Enum. Pl. iii, 211; Walp. Ann. iii, 484, and v, 830; Bl. Rumphia iii, 34, Pl. 147 and $\frac{163}{B}$ E; Miq. Fl. Ind. Bat. iii, 116 and De Palm. 27; Teysm. Cat. Hort. Bogor. 74; Kurz Veg. Bangka in Natuurk. Tijdscr. Ned. Ind. xxxii, 1864, 218; H. Wendl. in Kerch. Les Palm. 235; Gard. Chron. Febr. 6 (1897), 86, f. 23; Becc. in Rec. Bot. Surv. Ind. ii, 208.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 5–12 mm. in diam. *Leaf-sheaths* flagelliferous in the adult plant when not bearing spadices, gibbous above, striate longitudinally, sparingly armed with a few scattered straight spreading spinules, which rest on a bulbous base, and further clothed densely in youth like the petioles; rachises and spadices with fulvous deciduous hairs, these resting on bulbous permanent bases which ultimately render scabrid the entire surface of the sheaths and other parts of the plant. *Leaf-sheath flagella* filiform, flattened and almost unarmed in their basal portion, finely aculeolate upwards. *Ocrea* short, obliquely truncate, densely bristly-ciliate chiefly at the margin. *Leaves* non-cirriferous, elongate oblong and often suddenly contracted above the middle in outline, 35–70 cm. long, including the petiole; this 10–15 cm. long, deeply and broadly channelled above, rounded beneath, where armed with scattered solitary slender claws and furthermore, mainly near the margins, with some straight spines; rachis densely hairy-furfuraceous, bifaced above, rounded beneath where feebly armed from base to summit with small solitary claws; sometimes almost smooth; leaflets thin in texture, herbaceous, very numerous (40–50 on each side) patent, beautifully pectinate, very regularly and closely set, linear and almost equally broad from the base to the summit, suddenly plicate at the base and also suddenly acuminate at the summit into a setose tip, green and subconcolorous on both surfaces, more or less distinctly 3-costulate, the costae furnished above with rigid short 1·5–2 mm. long bristles; the mid-costa often provided with a solitary, long and strong bristle at its base at the junction with the rachis; on the upper surface occur 2–3 secondary slender minutely spinulous nerves between each costa; on the under surface there are no long bristles and all the nerves are densely covered with very fine light hairs, the primary ones more finely than the others; margins with very fine closely set and long spreading light cilia; the largest leaflets, those from a little above the base to not very far above the middle, 7–10 cm. long, 5–8 mm. broad; the others often suddenly decreasing in length, the two of the terminal pair very small, unequal, free at the base. *Male* and *female spadices* very much the same, finely hairy-hispid on the spathes, spathels and involucres, slender, lengthened out into an aculeolate filiform flagellum. *Male spadix* ultradecompound, in one specimen 50 cm. long with 4–6 remote partial inflorescences; primary spathes tubular, not very closely sheathing, hairy-hispidulous throughout, papyraceous, the lowest somewhat flattened, acutely two-edged, more or less spinulous lower down on the edges, prolonged at the summit into a very short limb; upper primary spathes more cylindraceous, unarmed or aculeolate on the back terminating in a lanceolate acute limb; partial inflorescences inserted near the mouth of their own spathes, small, panicled, diffusely hairy-scabrid in every part; the largest, the lowest, with 3–4 branchlets on each side; of these the uppermost undivided and the lower ones with 2–4 spikelets; these small, callous at their insertion, with very few not regularly bifarious remote flowers; secondary spathes very narrowly tubular-infundibuliform, truncate, scariose and ciliate at the margin, acute or acuminate at one side; spathels hairy-scabrid, like the secondary spathes elongate, tubular, slightly infundibuliform, scarious, ciliolate and entire at the mouth, apiculate at one side; involucre attached laterally outside its own spathel at the base of the one above, distinctly pedicelliform or with a small regular cupular entire limb, this stalked by a narrow pedicel. *Male flowers* glabrous, narrowly oblong, obsoletely trigonous, rather obtuse, 3·5–4 mm. long; the calyx tubular, cyathiform, membranous, finely striate, rounded at the base, with 3 short broad rather obtuse teeth; the corolla almost twice as long as the calyx, narrowed to the base, divided into 3 lanceolate finely striate segments; the stamens as long as the corolla when in the bud, their filaments subulate and inflected at the apex; anthers linear-sagittate; rudimentary ovary very small, conic, 3-toothed, papilliform. *Female spadix* simply decompound, 40–50 cm. long; primary and secondary spathes and spathels as in the male spadix; partial inflorescences few, very small, the largest, the lowest 5–8 cm. long, arched subscorpioid, inserted at the mouth of their own spathes with a distinct axillary callus; the main axis slender, sinuous, with 5–6 spikelets at most on each side; spikelets small, slender, arched, recurved, their axis zigzag-sinuous, the largest, the lowest, 1·5–2 cm. long with 5–6 remote flowers on each side; the two series slightly pointing upwards (not exactly in one plane); involucrophorum more or less distinctly pedicellate, laterally attached outside its own spathel at the base of the one above with a relatively conspicuous callus at its axilla next to the axis; involucre cupular, more or less emarginate on one side; areola of the neuter flower depressedly lunate, more or less sharply bordered, with a punctiform scar in the centre. *Neuter flowers* long-persistent, very much like the male ones, but thinner, more acute at the summit and more narrowed at the base. *Female flowers* ovate-conic with a broad base, small, 2 mm. long, 1 mm. broad; the calyx conic, suburceolate, green, striate, very shortly 3-toothed; the corolla as long as the calyx, divided down almost to the base into 3 ovate-lanceolate rather acute segments; the staminal urceolum deeply divided into 6 elongate triangular filaments; anthers sagittate, hardly shorter than the lobes of the corolla; ovary oblong; style short subtrigonous, stigmata pale and of a waxy appearance when dry, trigonous, subulate, strongly papillose inside, reflexed amongst the lobes of the corolla during the anthesis. *Fruiting perianth* very shortly pedicelliform, its calyx indurated and callous at the base. *Fruit* (mature) globose or globose-ellipsoid, 10–12 mm. in diam., rounded to both ends, topped by a narrow acute mucro; scales in 18–20 series, squarrose or not very appressed, almost flat, very superficially channelled along the middle, light straw-coloured, with paler, narrow, subscarious, erosely-toothed margin and rather acute point. *Seed* subglobose, slightly compressed laterally with many deep narrow furrows or plicae radiating from the centre of one of the faces, where is placed the chalazal fovea, to the centre of the other face, where is situated the embryo.

HABITAT.—The damp forests of the calcareous region in the south of Java and in the Island of Nussa, Kambang, *Blume.* From Java I have seen some good specimens in the Berlin Herbarium, collected by Jagor. It grows also in Sumatra, *Korthals.* Blume (l. c.) and Miquel (Ann. Bot. Ind. i, p. 6.) mention this species also from Borneo, but the specimens I have seen as coming from this country differ in many respects from the typical ones from Java. In West Java it receives the name of "Hooy mukka" and in the eastern part that of "Panjaling tjatjing" (Blume).

OBSERVATIONS.—This is a very remarkable species closely related to *C. exilis* of the Malayan peninsula and to other Bornean species. It seems a rather variable plant in the dimensions of the leaves and in the size of the fruit. The specimens from Sumatra collected by Korthals have more robust leaves than the Javan ones, and in one of them I counted about 60 leaflets on each side.

The seed is placed vertically in the fruit, and in consequence it is not depressed as described by Blume, but laterally compressed; the groove on one of the faces, of which Blume speaks, is that occupied by the embryo.

The seed described and figured by Blume, which I have seen, is almost round; 9 mm. in diam. and 5 mm. thick; that of Jagor's specimens (perhaps not quite mature) is slightly ovoid, 7 mm. long, 5 mm. broad, and 4 mm. thick, but the structure is the same as in Blume's one.

I have seen a very incomplete specimen of what Blume has considered as *C. ciliaris* from Borneo. This specimen differs from the typical ones in the leaflets less distinctly 3-costate or with a rather strong mid-costa and the side-nerves slender and with shorter bristles than in the type, and in the leaf-rachis armed in its lower surface along the middle and also at the sides with numerous approximate small claws; the basal portion of the spadix is also aculeolate. I entertain, however, some doubts about the locality of this specimen and therefore about the presence of *C. ciliaris* in Borneo.

C. ciliaris is characterized amongst the allied species by its very small linear leaflets, almost equally broad from the base to a little below the summit with very numerous excessively fine long cilia at the margin; the hairy-scabrid leaf-sheaths, spathes and spathels; and the roundish fruit.

PLATE. 129.—Calamus ciliaris *Bl.* Two entire leaves, one with portion of the sheathed stem and a flagellum; an almost entire male spadix; mature fruit; seen

entire seen from the chalazal side; seed cut through the embryo. From the Leyden Herb.

108. CALAMUS EXILIS Griff. Palms Brit. India, 51, pl. CLXXXVI A. f. iv; Mart. Hist. Nat. Palm. iii, 333 and pl. 176, f. vii; Walp. Ann. iii, 484 and v, 830; Miq. Fl. Ind. Bat. iii, 116; Hook. f. Fl. Brit. Ind. vi, 454; Becc. in Rec. Bot. Surv. Ind. ii, 208.

DESCRIPTION.—Scandent, slender or of moderate size, 3–7 m. long. *Sheathed stem* in delicate plants 5–6 mm., in luxuriant ones 1–2 cm. in diam. *Leaf-sheaths* flagelliferous, gibbous above, obliquely truncate and very densely hairy, ciliate or bearded at the mouth, very scabrid, being densely covered with innumerable short rigid hairs, which rest on a bulbous base, and furthermore often, but not always, more or less armed with straight horizontal or deflexed, usually short, broad-based, slender or rather robust, solitary or more rarely confluent spines; the scabridity which covers the spathes extends also to the base of the petioles, primary spathes, flagella, and in a lesser and variable degree to the leaf-rachis and different parts of the spadix, except flowers and fruit. *Ocrea* very short, densely bearded. *Leaf-sheath flagella* slender, filiform, flattened and unarmed in their basal portion, and furnished upwards with numerous irregularly scattered, not or slightly confluent small claws. *Leaves* not cirriferous, 50–60 cm. and in luxuriant plants 1–1·2 m. long; petiole relatively long, about one-fifth of the total length of the leaf (12–25 cm.), rather broad (5–8 mm.), flat or slightly channelled near its base above, convex and quite unarmed or more or less clawed beneath, the margins rather acute and armed with straight and horizontal or more or less recurved spines, or with the two kinds mixed together; rachis more or less scabridulous and hairy, bifaced above, armed beneath along the middle throughout its whole length with solitary claws; leaflets numerous, thinly papyraceous, alternate or subopposite, equidistant, 12–17 mm. apart, green and subconcolorous on both surfaces, linear-sublanceolate, gradually attenuate into a not very acute base, subulately acuminate and aristate at the apex, with the mid-costa slender but acute above and 2–5 secondary nerves on each side of it; of these one often stronger than the others and therefore occasionally more or less distinctly 3-costulate; secondary nerves more or less hairy-hispidulous; transverse veinlets not very conspicuous, distant and short; margins hairy-hispid or adpressedly ciliate; the largest leaflets in delicate plants are 15–25 cm. long, 8–10 mm. broad and in luxuriant ones 20–25 cm., by 12–14 mm.; the upper ones narrower and shorter; the two of the terminal pair quite free at the base. *Male spadix.* . . . . . *Female spadix* decompound, rigid, erect and straight in its basal part, from 60 cm. to 2 m. in length, including a very slender filiform aculeolate terminal flagellum, bearing a few (2–5) partial inflorescences; primary spathes coriaceous, elongate, tubular, closely sheathing, hairy or bearded at the mouth, prolonged at the summit into a triangular acute point, this keeled on the back; the lowermost flat on the inner side near its base, convex on the back, slightly flattened and two-edged upwards, the edges spinulous, otherwise unarmed or sparsely aculeolate; upper primary spathes more cylindraceous than the first, usually sparsely aculeolate, somewhat narrowed to the base, where more or less armed, especially in the upper part of the spadix, with scattered claws on the outer side; partial inflorescences panicled, rather dense and terminating in a scorpioid floriferous summit, from 7–10 to 20–30 cm. long, arising erect from their own spathes, then arched and scorpioid, respectively with 4–5 to 10–15 spikelets on each side; these with an obvious secund arrangement and gradually decreasing in length from the base to the summit; secondary spathes cylindraceous or very slightly infundibuliform, hispid-scabrid, almost horizontally truncate and ciliate at the mouth, slightly prolonged at one side into a short triangular point; spikelets inserted above the mouth of their own spathes with a distinct axillary callus, recurved, scorpioid; the largest, the lowest, 3–6 cm. long. with 10–16 remote flowers, these arranged in two divergent series (not in one plane) and slightly pointing upwards; upper spikelets gradually smaller, those near the summit very few-flowered; spathels elongate-cylindraceous, similar to the secondary spathes but smaller; involucrophorum laterally inserted outside its own spathel at the base of the one above, with a distinct axillary callus next to the axis, subcalyciform, stalked by a more or less elongate (even 5 mm.) thick pedicel or neck; involucre slightly exceeding the involucrophorum, subdisciform or pateriform, slightly concave, subcircular or obsoletely trigonous; areola of the neuter flower depressed, slightly tumescent. *Female flowers* ovoid-oblong, about 4 mm. long, glabrous, very finely and obsoletely striately veined outside; the calyx with 3 short triangular acute teeth; the corolla divided about midway down into 3 acute segments, these narrower than the lobes of the calyx and barely longer than these; stamens forming an urceolum by their united bases, elongate and subulate in their free portion. *Fruiting perianth* pedicelliform, campanulate. *Fruit* elongate-ellipsoid or ovoid-elliptic, suddenly narrowed at the summit into a short small conic beak, caudiculate at the base, very variable in size, 15–16 mm. long and 8 mm. broad, or longer and relatively narrower, in one specimen 22 mm. by 7 mm.; scales squarrose or not very closely adpressed, in 14–16 series, longer than broad, shortly prolonged into a rather obtuse tip, almost flat, obsoletely channelled along the middle, opaque, yellowish-brown, with a narrow dark intramarginal line, the margins erosely toothed. *Seed* linear-oblong, acute at both ends, with the elongate chalazal fovea in the centre of the raphal side, from which radiate many deep narrow furrows or plicae which pass over both ends and sides of the seed and converge into the embryo which is in the centre of the opposite face; albumen horny, ruminated owing to the deep plicae mentioned above; these filled with a resinous yellowish-green very bitter stuff; embryo lateral in the centre of one of the faces.

HABITAT.—The Malayan Peninsula. The specimen upon which Griffith based his description was collected by E. Fernandez on the Gunong Ladang (Mt. Ophir) near Malacca. This fine species has been since then rediscovered by Sir George King's collectors at Larut near Perak (Nos. 6245, 2734, 6245) at 250–300 m. elevation; at Ulu Bubong (No. 10259); also at Thaiping at 1,000–1,200 m. on Gunong Ijuk, *Scortechini* (No. 8457).

OBSERVATIONS.—Very distinct amongst the Malayan and Indian species, but closely related to the others of the group of *C. ciliaris.* It is distinguished by the very scabrid leaf-sheaths, by the very elongate and narrow ellipsoid fruit and by the rather large leaves with numerous equidistant linear-lanceolate leaflets. Very variable in general dimensions and in the more or less elongate fruit and in the hairiness of the leaflets. In the authentic specimen of Griffith the two faces of the leaflets appear at first sight glabrous, but under the lens they are bristly spinulous above on the mid-costa and on a secondary nerve on each side of it, and beneath are densely hairy-hispidulous on all nerves and at the margins; in some of the recently-collected specimens the bristly nerves are 5–7 above and in others the entire upper surface is more or less hairy-hispid, while the lower one is densely hairy and the margins closely and adpressedly ciliate. Griffith's authentic specimen, which I have seen in the Herbarium at Kew, has a very slender stem 6–12 mm. in diam. and the partial inflorescences have only 2–3 very few-flowered spikelets on each side.

The specimen No. 10259 of the Calc. Herb. has one leaf terminating in a rudimentary aculeolate cirrus, which is about 1 cm. long. and projects between the two apical leaflets.

PLATE 130.—Calamus exilis *Griff.* Portion of the sheathed stem with an entire fruiting spadix; an intermediate portion of a leaf (under surface); the summit of a leaf (upper surface); seeds (ventral and dorsal side), one longitudinally cut through the embryo.—From No. 2737 Herb. Calc. in H. Becc.

109. CALAMUS HISPIDULUS Becc. in Rec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* about 18 mm. in diam. *Leaf-sheaths* flagelliferous, very densely clothed when young with coarse yellowish or fulvous, long, spreading, deciduous hairs resting upon bulbous permanent bases, and rendering scabrid the surface of the older sheaths. *Leaves* not cirriferous, about 60 cm. long; petiole 8–10 cm. long, 6 mm. broad, flattish or slightly channelled above, feebly armed on the margins as well as along the centre of the round lower surface with a few very small and slender claws, which become closer and somewhat stronger, but always solitary, throughout the entire rachis; this and the petiole are furthermore rendered scabrid by the very short bulbous hairs with which they are covered; leaflets not many, 11–13 on each side, rather remotely equidistant, thinly papyraceous or subherbaceous, very narrowly lanceolate or linear-lanceolate, almost equally narrowed to both ends, but very finely acuminate at the apex, green and concolorous on both surfaces even when dry; in the upper surface the mid-costa and 3 or 4 secondary nerves on each side of it bristly-spinulous; in the lower one the secondary and tertiary nerves (about 13–14 on each side of the mid-costa) covered with very minute hairs; margins ciliated with rather long and distant bristles; transverse veinlets fine, remote, short; the largest leaflets, the mesial, 18–20 cm. long, 10–15 mm. broad, the two of the terminal pair occasionally not quite opposite, free at the base. *Male spadix* . . . . *Female spadix* simply decompound, slender, about 70 cm. long, including a terminal filiform, very finely irregularly clawed flagellum; primary spathes very finely scabrid-papillose, tubular, elongate, not very closely sheathing, slightly enlarged above, obliquely truncate entire and ciliolate-hispid at the mouth, prolonged at one side into a triangular acute point; the lowest spathe slightly compressed and acutely two-edged in its lower portion, the edges smooth or with a prickle here and there; the upper primary spathes cylindraceous, narrowed to the base, rather densely armed on the outer side with small scattered claws; partial inflorescences few (3–4), short, arising erect from inside the mouth of their respective spathes, then arched scorpioid; the largest, the lowest, 6–7 cm. long with 8–10 alternate and subunilateral gradually diminishing spikelets, the summit bearing solitary flowers right and left; secondary spathes a good deal more strongly scabrid-hispidulous than the primary ones, tubular, very slightly enlarged above, closely sheathing, truncate and ciliate at the mouth, prolonged at one side into a finely subulate hairy tip; spikelets attached above the mouth of their own spathes with a distinct axillary callus, patent, arched-scorpioid, the largest, the lowest, 15–20 mm. long, with 8–10 alternate remote biseriate assurgent flowers; the other spikelets gradually shorter, the uppermost with 2–3 flowers only; spathels elongate, tubular, closely sheathing, narrowly infundibuliform, truncate and ciliate at the mouth, prolonged at one side into a short triangular point, scabrid-hispidulous like the secondary spathes; involucrophorum attached outside its own spathel at the base of the one above, calyculiform-subdiscoid, very distinctly pedicellate; involucre shallowly cupular, orbicular, entire or obsoletely toothed; areola of the neuter flower depressed, slightly irregularly tumescent with a punctiform scar in the centre. *Female flowers* oblong, slightly narrowed to the summit, 4 mm. long; the calyx glabrous, finely obsoletely striately veined, very shortly 3-toothed; the corolla as long as the calyx. *Fruiting perianth* shortly pedicelliform, the lobes of the calyx and the segments of the corolla spreading; these last one-half narrower than the first and black at their summit. *Fruit* elongate-ellipsoid, very like that of *C. exilis*, about 2 cm. long, 8–10 mm. broad, equally narrowed to both ends, distinctly apiculate-mucronate; scales squarrose or loosely imbricate with a slightly prolonged not adpressed tip, almost flat, very faintly channelled along the middle, pale yellowish-brown, opaque, with chestnut polished erosely-toothed margin. *Seed* apparently very similar to that of *C. exilis* (seen immature by me).

HABITAT.—North-West Borneo on the Gunong Wah near the sources of the Sarawak River, *Beccari* P. B. No. 2821.

OBSERVATIONS.—Very nearly allied to *C. exilis* from which it differs in the leaves with fewer leaflets; these furnished with many more spinuliferous nerves, and in the young leaf-sheaths densely setose-hispid when young and ultimately scabrid through the persistent bulbous bases of the deciduous hairs, while *C. exilis* owes the roughness of its leaf-sheaths to innumerable very short rigid non-deciduous hairs, each of them resting also on a small tubercle.

PLATE 131.—Calamus hispidulus *Becc.* The entire summit of a plant with a fruit spadix.—From Becc. P. B. No. 2821.

110. CALAMUS PILOSELLUS Becc. in Rec. Bot. Surv. Ind. ii, 208.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 1 cm. in diam. *Leaf-sheaths* strongly gibbous above, very sparingly spinulous, not scabrid to the touch, but minutely punctate or very finely tubercled under the lens, probably hairy when young. *Ocrea* very short glabrous. *Leaves* 60 cm. long (in one specimen), including the petiole; this 10 cm. long, glabrescent in its first portion, scabrid and hispidulous upwards, rounded beneath, slightly and broadly channelled above (or flat when in a fresh state?) with the margins acute and armed with a few not very long straight or slightly hooked solitary prickles; rachis armed beneath along the middle (like the petiole) with solitary claws, these becoming closer and smaller towards the apex, bifaced and acute above and covered with a ferrugineous down, and furthermore finely tubercled-scabrid owing to the bases of the rusty hairs with which it is clothed; leaflets numerous (35 pairs in one leaf), equidistant, 10–12 mm. apart, very regularly inserted at an angle of about 45°, alternate or almost opposite, narrowly lanceolate, almost equally narrowed to both ends, acuminate at the summit, thinly papyraceous, rather firm, green and subconcolorous on both surfaces, with the acute mid-costa and 2–3 secondary nerves on each side of it furnished with long fulvous bristles on the upper surface, where furthermore on the very slender tertiary nerves are longitudinally arranged numerous very minute and short bulbous hairs; on the under surface the mid-costa and the secondary nerves are indistinct and the very numerous (about 50) and very slender tertiary nerves are closely covered with excessively minute and short bulbous hairs, which render that surface scabrid to the touch and are almost invisible to the naked eye; margins rather closely ciliated with fine long fulvous erecto-patent hairs; transverse veinlets few, distant and short, not very conspicuous; the largest leaflets, the mesial, 10 cm. long, 10–11 mm. broad, acuminate to a capillary point, the lowermost smaller and narrower, the upper ones a trifle smaller but less acuminate and with a bristly-hairy tip, the two of the terminal pair free at the base. *Male spadix* slender, elongate, rigid, erect, in one specimen 1 m. in length, including the terminal filiform flagellum, glabrous, smooth, and not hairy-scabrid in any part, ultradecompound, with 5 partial inflorescences; primary spathes elongate, tubular, closely sheathing, obliquely truncate, entire and naked at the mouth, where prolonged at one side into a short point; the lowermost unarmed, somewhat flattened, rather acutely two-edged, the upper ones cylindraceous, sparsely aculeolate on the dorsal side near their base; partial inflorescences panicled, lax, the lowest, the largest, 13 cm. long, inserted at or a little above the mouth of their respective spathes, with a distinct axillary callus and transverse rima, ascending at first, then arched and scorpioid, with a few branchlets near the base and some very slender spikelets in their upper part; the upper inflorescences with only 3–4 spikelets on each side, of which the lowermost barely branched and the upper ones very short and very few-flowered; secondary spathes unarmed, glabrous, tubular, very slightly enlarged above, closely sheathing, prolonged at one side into a triangular acute or acuminate point; spikelets (like the branchlets) inserted above the mouth of their own spathes, with a distinct axillary callus, patent, arched downwards and subscorpioid; the largest, the lowest, 15–20 mm. long with 8–10 alternate remote biseriate assurgent flowers; the other spikelets gradually shorter, the uppermost with 2–3 flowers only; spathels elongate, tubular, closely sheathing, slightly enlarged above or narrowly infundibuliform, subscarious in their upper part, prolonged at one side into a triangular acute point; involucre discoid or pateriform, circular or obsoletely trigonous, slightly concave or almost flat, inserted outside its own spathel at the base of the one above, with a distinct axillary callus next to the axis, more or less supported by a thick short pedicel or neck.—*Male flowers*, *female flowers* and *fruit* unknown.

HABITAT.—Borneo; probably in Sarawak, *Lobb* 1853 in Herb. Kew.

OBSERVATIONS.—Of this I have seen an entire leaf with a portion of its leaf-sheath and an entire male spadix from which all the flowers had fallen. Related to

C. ciliaris, but distinct by its much larger leaves with fewer larger lanceolate leaflets by the glabrous not scabrid spadix and by the almost unarmed, not scabrid leaf; sheaths. It is also allied to *C. exilis,* but in this the sheaths and the different parts of the spadix are very scabrid and the leaflets are a good deal more elongate and beneath only spinulous on the primary and secondary nerves, the tertiary ones being naked.

PLATE 132.—Calamus pilosellus *Becc.* The entire specimen of Lobb 1853 in Herb. Kew.

111. CALAMUS SARAWAKENSIS Becc. in Records Bot. Surv. Ind. ii, p. 208.

DESCRIPTION.—Scandent, slender. *Sheathed stem* 7–10 mm. in diam. *Leaf-sheaths* flagelliferous, strongly gibbous above, obliquely truncate and smooth at the mouth, opaque, not rough to the touch, but under a strong lens very finely papillose, finely longitudinally striate, armed with a few scattered solitary short broad-based horizontal straight spines. *Ocrea* very shortly liguliform and forming a narrow glabrous smooth rim to the mouth of the sheath. *Leaf-sheath flagella* very slender, flattened and almost unarmed in their lower portion, feebly clawed upwards, otherwise glabrous and not scabrid. *Leaves* not cirriferous, 60–65 cm. long, including the petiole; this rather elongate (18–20 cm.), channelled only near the base, otherwise flat and smooth above, slightly convex beneath, the margins acute and armed with relatively strong remote short horizontal straight or slightly hooked prickles; rachis slender, armed beneath along the middle (as is the petiole) with solitary scattered black-tipped claws, bifaced in its upper surface where hairy-ciliolate on the very acute angle, otherwise glabrous and smooth; leaflets not numerous, 16–18 in all, inequidistant, but not fascicled, 3-5 cm. apart, linear-ensiform or linear-lanceolate, thinly papyraceous, dark-brown like the other parts of the plant when dry, very slightly paler beneath than above, almost equally narrowed to both ends, acute at the base, gradually and finely acuminate to the summit into a bristly tip, with 5–7 very fine minutely spinulous costulae in the upper surface where the mid-costa is very slightly stronger than the side ones, and like the minor nerves sprinkled with very small scattered spinules; the lower surface entirely covered with very minute short subspinulous hairs, and these arranged along the very numerous longitudinal nerves and nervelets; transverse veinlets rather sharp, but remote and very short; margins very remotely, adpressedly and inconspicuously spinulous; the largest leaflets, those about the middle, 20–22 cm. long, 15–16 mm. broad; the lower ones narrower and shorter, the upper somewhat shorter, but not narrower; the two of the terminal pair free at the base.

HABITAT.—Borneo; in Sarawak on Mount Mattang near Kuching, *Beccari* P. B. No. 1920.

OBSERVATIONS.—The type-specimen consists of a portion of the sheathed stem with two leaf-sheaths and two entire leaves; the spadices are wanting; nevertheless its affinities with the other species of the group of *C. ciliaris* are very obvious. It is characterized by the inequidistant, not numerous, linear-lanceolate leaflets which have 5–7 slender spinulous costae above, and have the lower surface entirely covered with very minute spinulous hairs, these arranged in very close longitudinal lines; the margins remotely inconspicuously spinulous. The leaf-sheaths are not scabrid as in *C. pilosellus*, but this has numerous equidistant small leaflets besides other characteristic marks.

I consider as belonging to this species a specimen of a leaf and of an entire male spadix preserved in the Calcutta Herbarium and collected by Lobb in Sarawak. The leaf is 75 cm. long and bears 28 equidistant leaflets, of which the largest are 25–26 cm. long and 17–18 mm. broad, not differing from those described above, but a little more densely ciliate on both surfaces; the small portion of the sheath attached to the leaf is unarmed; the rachis is rusty-lanuginose and ciliate upwards. The spadix is more than a metre in length and is terminated with a small aculeolate flagellum; the spathes and spathels are glabrous and not in the least degree scabrid; the partial inflorescences are branched in their lower portion and bear many arched spreading spikelets; the male flowers are oblong, 4–5 mm. long, with the calyx urceolate-campanulate, broadly 3-toothed, finely striately veined; the corolla twice and twice and a half as long as the calyx.

Another male spadix from which all the flowers have fallen away, collected by me in Sarawak (P. B. No. 343), apparently also belongs here; it has the primary spathes as in *C. pilosellus*, but they are not scabrid; the secondary spathes and the spathels infundibuliform, loosely sheathing, in their upper part glabrous and smooth; the involucre shallowly cupular, sessile, just outside its own spathel at the base of the one above.

PLATE 133.—Calamus sarawakensis *Becc.* Portion of the sheathed stem with two entire leaves;—from P. B. No. 1920 (sterile specimen); the male spadix without flowers collected by me in Sarawak (No. 343); portion of an inflorescence with male flowers;—from Lobb's specimen mentioned above and preserved in the Calc. Herb.

112. **CALAMUS RHOMBOIDEUS** Bl. in Roem. et Schult. Syst. Veg. vii, pt. 2, 1332; Mart. Hist. Nat. Palm. iii, 212 (1st edit.) and 341 (partly as to descript.); Kunth Enum. Pl. iii, 212.; Walp. Ann. iii, 490 and v, 832; Bl. Rumphia iii, 60 (partly as to descript. and excl. var. β) and 154; Miq. Fl. Ind. Bat. iii, 134 (excl. var.) and De Palm. 28; Teysm. Cat. Hort. Bogor. 75; H. Wendl. in Kerch. Les Palm. 237; Becc. Malesia ii, 77 and in Rec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Scandent; of moderate size; covered on the leaf-sheaths, petiole leaf-rachis and spadix with a greyish short adherent furfuraceous-tomentose indumentum. *Sheathed stem* about 3 cm. in diam. *Leaf-sheaths* gibbous above, longitudinally striolate, sprinkled here and there with very short, conic, subtubercular spines. *Leaves* not cirriferous (or sometimes terminating in a very small and short rudimentary cirrus beyond the two end pinnæ) ·7–1 m. long (Blume); petiole about 30 cm. long, deeply channelled and unarmed above (Blume), rounded and armed with scattered solitary or confluent claws beneath; rachis smooth and not very acutely bifaced above, rounded and sparingly armed beneath with small claws; leaflets very few, 4–7 on each side, papyraceous, rather firm, opaque, green above, slightly paler beneath, alternate or subopposite, erecto-patent, broadly ovate, rhomboidal, almost equally narrowed to both ends, cuneately attenuated, acute and sometimes asymmetric, but not ansate at the base, suddenly contracted at the apex into a short narrow bristly-ciliate tip, flabellate or radiate-plicate with 9–12 main costae almost equally prominent on both surfaces, radiately divergent from the base, of which the central only reaching the summit and the side ones arching near the margins and evanescent at different levels; secondary nerves slender and like the primary ones naked on both surfaces; transverse veinlets very numerous, crowded, distinct and not much interrupted; the margins bristly-ciliate from above the middle; all leaflets of about the same size, the intermediate ones 20–23 cm. long, 9–10 cm. broad, the two of the terminal pair quite discrete at the base, slightly smaller than the others. *Male spadix* simply decompound, elongate, sometimes up to 2 metres in length (?), flagelliferous at the summit; primary spathes tubular, cylindraceous, closely sheathing, thinly coriaceous, slightly enlarged above, prickly chiefly on the back near the base, prolonged at the summit into a short ovate acute point; partial inflorescences numerous, attached near the mouth of their own spathes, elongate, rather rigid, erecto-patent, those seen by me 30–40 cm. long with 8–12 spikelets on each side; secondary spathes narrowly tubular, infundibuliform, gradually decreasing in length from the base of the inflorescence upwards (owing to the spikelets being gradually more approximate), the lowest, the largest 2–2·5 cm. long, unarmed, longitudinally finely striately veined, scaly or subglabrous, truncate and entire at the mouth, slightly prolonged at one side into a short obtuse patent or deflexed point; spikelets arched, horizontal or deflexed, inserted just at the mouth of their own spathes, with a distinct axillary callus, rather rigid and thick, the longest, the lowest, 5–7 cm. long with 13–15 perfectly bifarious flowers on each side; the upper ones somewhat shorter and with fewer flowers; spathels approximate, bracteiform, very broad, concave, patent or subreflexed, obtuse, entire, obsoletely striately veined; involucre subringent, more or less regularly cupular, sometimes longer than broad, occasionally obscurely bidentate and two-keeled on the side next to the axis, pushing down its own spathel and laterally attached to the base of the one above. *Male flowers* large, 8 mm. long, 2 mm. thick, almost horizontally inserted, cylindraceous, obtuse, firm in texture; calyx cyathiform, campanulate, boldly striately veined with 3 short very broad obtuse teeth; corolla almost 3 times as long as the calyx, divided from near the base into 3 oblong not or indistincly striately veined opaque segments; stamens with filiform filaments, these when in the bud inflected; anthers linear-sagittate, acute, versatile, attached a little below the apex; rudimentary ovary minute, 3-partite. *Female spadix* and *fruit* unknown.

HABITAT.—Java, on the Megamendong mountain. According to Blume it occurs also in Sumatra and Borneo. From Sumatra I have seen no specimens. Those from Borneo, which Blume considers as only a variety (*β. rigida*) of the Javan plant, seem to me specifically distinct.

OBSERVATIONS.—I have seen of *C. rhomboideus* a leaf and a portion of the spadix of the authentic specimen, the same described by Blume and figured in plate 154 of the "Rumphia." Blume does not exactly state the locality of the male spadix, but the portion sent to me by the late Dr. Boerlage is labelled as having been gathered on the Megamendong.

The var. β *rigida* has been made by me the type of *C. Blumei.* The female spadix and fruit described by Blume as belonging to *C. rhomboideus* very probably are parts of a quite different species, apparently of *C. Scipionum* or of a very nearly allied species. The leaf I have seen terminates with two leaflets without any vestige of a cirrus between, but very probably sometimes the rachis is slightly prolonged beyond the two terminal leaflets as in *C. tomentosus.*

C. rhomboideus is very remarkable amongst all the congeners by its large rhomboid radiately many costate leaflets, it is only very closely related to and perhaps not specifically distinct from *C. tomentosus* Becc.

PLATE 134.—Calamus rhomboideus *Bl.* The summit of a male spadix; the summit of a leaf (under-surface).—From Blume's authentic specimen in the Leyden Herb.

CALAMUS RHOMBOIDEUS, var. UBERRIMUS Miq. in Journ. Bot. Neerl. i, 23 and Prodr. Fl. Sum. 595 (*rhomboidalis*).

I have seen no specimen of this variety, of which Miquel says that the male spadix has very long partial inflorescences with the lowest spikelets bearing 21 secondary spikelets at their base (amentis inferioribus ternis binisve) 3 inches (7·5 cm.) long.

HABITAT.—Sumatra: near Muara-duwa in the Prov. of Palembang, *Miquel.*

113. CALAMUS TOMENTOSUS Becc. in Hook. f. Fl. Brit. Ind. vi, 455 and in Rec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Scandent, of moderate size, 10–12 met. long (Scortechini). *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* appressedly and densely covered like the petioles, rachises, flagella and spadices, with a white and sometimes also fuscescent adherent soft almost flocculent tomentum, slightly gibbous above, thick in texture and almost woody, faintly longitudinally costate under the insertion of the flagellum or of the spadix, more or less armed, chiefly in their upper part, with very short spines, which have a very broad swollen mammillate base covered by the indumentum and a very small pungent ascendent point. *Leaf-sheath flagella* very long, in one specimen 3·5 m. in length, plano-convex in its basal portion, cylindraceous upwards, where armed with black-tipped usually ternate claws. *Ocrea* large, 4–5 cm. long, membranous, tomentose, unarmed, prolonged externally (not in the axilla of the petiole) into a broadly triangular limb, this often bilobed at the summit, ultimately marcescent and deciduous. *Leaves* relatively short and robust and with few leaflets, not cirriferous or terminating in a very short rigid unarmed or aculeolate prolongation of the rachis which protrudes about 1 cm. beyond the terminal pair of leaflets; petiole subterete or slightly compressed, with very obtuse angles, but always convex above, of very variable length (from 12 to 40 cm.), armed with a few scattered short broad-based, black-tipped claws; rachis subterete in its first portion, obsoletely angular upwards where not distinctly bifaced above, and rather strongly armed beneath with solitary, ternate or half-whorled and even scattered claws; leaflets alternate or subopposite, erecto-patent, rather remote, 8–12 cm. apart, papyraceous, rather firm, opaque, green above, slightly paler beneath, glabrous, broadly ovate-rhomboidal, almost equally narrowed to both ends, cuneately attenuated, acute and sometimes slightly asymmetric but not ansate at the base, suddenly contracted at the apex into a bristly-ciliate, linear, 10–15 mm. long tip, flabellate or radiately plicate with 7–9 main costae, almost equally prominent on both surfaces and radiately divergent from the bases of which only the central reaching the summit, and the side ones arching near the margins and evanescent at different levels; secondary nerves slender and like the primary ones naked on both surfaces; transverse veinlets numerous crowded, parallel and continuous across the blade; margins slightly undulate from above the middle where usually closely ciliated with spreading subspiny bristles; the middle-sized leaflets 25 cm. long, 10 cm. broad, the upper slightly smaller; the two of the terminal pair divaricate, in one specimen 18 cm. long and 7 cm. broad; the largest leaflets seen by me 35 cm. long, 11 cm. broad. *Male spadix* . . . . . *Female spadix* flagelliform, very elongate; in one specimen 2·3 m. in length, including a terminal flagellum; partial inflorescences only two; the flagellum itself 70 cm. long, strongly and somewhat irregularly armed with ternate or half-whorled claws; primary spathes tubular very elongate, very closely sheathing, more or less armed, especially on the outer side, with solitary and scattered or slightly confluent small claws, entire, not ciliate, and obliquely truncate at the mouth, prolonged at one side into a broadly triangular acute or acuminate point; the lowest spathe very slightly compressed, obsoletely edged, the upper ones cylindraceous very slightly narrowed to the base; partial, inflorescences rigid, erecto-patent, 20–25 cm. long, with 6–7 distichous spikelets on each side; secondary spathes tubular-infundibuliform, unarmed, almost horizontally truncate and entire at the mouth, slightly prolonged at one side into a short ciliolate point; spikelets attached just outside the mouth of their own spathes, slightly callous at their axilla, arched, horizontal or deflexed, rigid and rather thick; the lowest, the largest, 5 cm. long with 8–9 flowers on each side, the others gradually smaller; the uppermost 2–2·5 cm. long with 4–5 flowers on each side; spathels shortly asymmetrically infundibuliform, truncate, entire and ciliolate at the margin, slightly apiculate at one side, white-tomentose like the spathes; involucre slightly pushing down the point of its own spathel and attached at the base of the one above, very shortly cupular; involucre cupular, slightly exceeding the involucrophorum; areola of the neuter flower distinctly lunate, sharply bordered. *Female flowers* ovate, obtuse (when not quite full grown); the calyx shortly 3-toothed, glabrous, striately veined. *Fruit* unknown.

HABITAT.—The Malayan Peninsula: in the District of Perak, *Scortechini* No. 431^b; at Larut, alt. 760–900 m. *Kunstler* No. 6993 in Herb. Calc.; and at 100m. in the same locality (Herb. Calc. No. 5332).

OBSERVATIONS.—A very remarkable species very nearly allied to *C. rhomboideus* with which a precise comparison is difficult as the female spadix of this is unknown and in *tomentosus* it is the male one that is not known. From the materials at my disposal *C. tomentosus* apparently differs from *C. rhomboideus* in the more distinctly cottony tomentum which covers the different parts of the plant (except the leaflets and the flowers) and in the leaflets with fewer costae, 7–9 instead of 9–12 and, if the statement of Blume be correct, in the petiole which is channelled above in *C. rhomboideus* and roundish in *C. tomentosus.*

PLATE 135.—Calamus tomentosus *Becc.* Portion of a sheathed stem with base of a leaf and of a flagellum; an almost entire female spadix in flower; the summit of a leaf, two leaflets from about the middle.—From Scortechini's No. 431^b in Herb. Becc.

CALAMUS TOMENTOSUS var. KORTHALSIAEFOLIUS Becc. in Rec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Smaller, slender. *Sheathed stem* 1 cm. in diam. *Leaf-sheaths* almost glabrous or partially covered, like the flagella, petiole and leaf-rachis, with very small silvery scales, which are visible only with a lens, very sparingly armed with small scattered depressed tuberculiform ascendent prickles. *Ocrea* about 1 cm. long. *Leaves* about 50 cent. long; with 5–6 leaflets on each side; rachis slightly prolonged beyond the two ultimate leaflets; these subshining in the upper surface, 5–7 costulate, 14 cm. long, 5 cm. broad, the margins not ciliate (or with the cilia deciduous?), symmetric acute and not ansate at the base.

HABITAT.—The Malayan Peninsula; on the Gunong Tambang Batak in the district of Perak, *Scortechini* No. 597^b. Malay name "Klunen."

OBSERVATIONS.—Without the intermediate forms nobody would suspect this to be only a variety of *C. tomentosus*, especially on account of the baldness of its sheaths upon which only very small scattered chaffy silvery scales similar to those that densely cover all the axial parts in the type may be discovered after a careful examination. This variety approaches *C. Blumei*, but in this the leaflets are distinctly asymmetrical and ansate at the base.

The number 5332 of the Calc. Herb. has a slender stem (17 mm. in diam.) is less tomentose and has smaller leaflets than the No. 6993 of the same Herb. and of the No. 431^b of Scortechini; the specimen mentioned (No. 5332) is however larger and more like the type than any other specimen of Scortechini (No. 1255) of which I have made a variety *intermedius* and which forms a passage to the var. *korthalsiaefolius*.

PLATE 136.—Calamus tomentosus *var.* korthalsiaefolius *Becc.* Two portions of sheathed stem each with an entire leaf.—From Scortechini's No. 597^b in Herb. Becc.

CALAMUS TOMENTOSUS var. INTERMEDIUS Becc.

DESCRIPTION—Slender. *Sheathed stem* 8–10 mm. in diam. *Leaf-sheaths*, petiole and leaf-rachis moderately prickly, not so densely tomentose as in the type and more or less covered with small confluent greyish chaffy scales which is also the source of the general indumentum in the type-specimens; the leaflets slightly larger than in var. *korthalsiaefolius* and relatively narrower (15 cm. long., 5–5·5 cm. broad).

HABITAT.—The Malayan Peninsula; on the Gunong Ijuk, *Scortechini* No. 1255.

114. CALAMUS BLUMEI Becc. in Rec. Bot. Surv. Ind. ii, 209.

C. rhomboideus var. *β. segmentis rigidioribus* Bl. Rumphia, iii, 60 (excl. descr. spadix and fruit); Miq. Fl. Ind. Bat. iii, 134.

C. rhomboideus (not of Bl.) Miq. Anal. Bot. Ind. i, 6.

DESCRIPTION.—*Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* (only the upper portion of one seen by me) with the rachis scurfy-furfuraceous, rather convex beneath, where strongly armed at distances of 1–3 cm. with dark-pointed light-based acute claws, naked and not very acutely bifaced in the upper face, prolonged beyond the two ultimate leaflets into a small, 2 cm. long, clawed rigid appendix; leaflets few on each side, alternate or subopposite, 7-9 cm. apart, 13–18 cm. long, 7–8 cm. broad, the two of the terminal pair being the smallest, firm in texture, thinly coriaceous, glabfous subshining above, barely paler beneath, broadly rhomboid-ovate, almost equally narrowed to both ends, cuneately attenuated, somewhat asymmetric, acute and distinctly stalked or ansate at the base, where acutely keeled above, suddenly contracted at the apex into a tail-like, very narrow, 12–15 mm. long, bristly-ciliate tip; flabellate or radiately plicate, with 5–7 main costae almost equally prominent on both surfaces and radiately divergent from the base, of which only the mesial which is somewhat eccentric and slightly stronger than the others, reaches the summit and the side ones arch near the margins and evanesce at different levels; secondary nerves slender and like the primary ones naked on both surfaces; transverse veinlets numerous, crowded and continuous and almost parallel across the entire blade; margins faintly undulate, slightly furfuraceous, ciliate only at the summit.

HABITAT.—Blume assigns Borneo as the native country of this species, and as it is stated that it was collected there by Korthals, it probably comes from the banks of the River Dusson. Blume gives also the indigenous name of "Tantuwu." But as some mixtures have apparently taken place amongst the specimens from which Blume derived the description of his *C. rhomboideus*, the home of *C. Blumei* remains up to the present somewhat uncertain.

OBSERVATIONS.—*C. Blumei* differs from *rhomboideus* in the rachis covered with a brown scurf (not tomentose), much more strongly clawed and more distinctly bifaced above, and in the leaflets which are smaller, firmer in texture, distinctly ansate and more asymmetric at the base and with fewer costae (5–7 instead of 9–12); the mid-costa also is eccentric and stronger than the other nerves, while in *C. rhomboideus* the costae are all of almost the same strength.

C. Blumei approaches the var. *korthalsiaefolius* of *C. tomentosus* more closely than it does *C. rhomboideus.*

The specimen of *C. Blumei* that I have seen is labelled in the Leyden Herbarium by Blume "*Calamus rhomboideus* Bl. var. *rigida*: Borneo, Korthals" and consists of the terminal portion of a leaf and a partial inflorescence of a female spadix stripped of its flowers or fruit; all these parts are attached to the same sheet of paper. I have further received from the late Dr. Boerlage some detached fruits which apparently belong to the inflorescence mentioned above and which correspond to the description given by Blume of the fruit of *C. rhomboideus.* But it is quite certain that the fruits and the inflorescence described by Blume as part belonging to his *C. rhomboideus* are those of a quite different species, probably of *C. Scipionum* or of a very nearly allied species, as I have already stated in my observations on *C. rhomboideus.* From the foregoing facts it appears that, as far as I can judge, Blume founded his variety of *C. rhomboideus* on the leaves of one species and the fruit spadix of another. I consider however *C. Blumei* established only on the portion of the leaf I have described above, and reproduced in plate 137.

PLATE 137.—Calamus Blumei *Becc.* The summit of a leaf (under-surface). From Blume's authentic specimen of *C. rhomboideus* var. *β.* in the Leyden Herb.

115. CALAMUS SPECTABILIS Bl. Rumphia, iii, 55, t. 152; Walp. Ann. iii, 487, and v, 831; Miq. Fl. Ind. Bat. iii, 125, and De Palmis Arch. Ind. 27; Becc. in Rec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Scandent, slender. *Sheathed stem* as thick as a finger. *Leaf-sheaths* covered like the leaf-rachis with a grey detachable scurf, longitudinally striated and armed with very short tooth-like spines (Blume). *Ocrea* unarmed. *Leaves* not cirriferous, about 60 cm. long; petiole very short, armed with conic-subulate straight or also hooked aculei; leaflets few, about 5 on each side, inequidistant but not aggregate, irregularly alternate, rather remote, oblong-obovate, somewhat concave or spoon-shaped, narrowed to the base and suddenly contracted into a short tip at the apex, with 5–7 costae, of which the side ones do not reach the summit and evanesce near the margin; 3–4 of them bristly above; margins bristly-ciliate; transverse veinlets conspicuous; the largest leaflets, the lowest, 18–20 cm. long and 8 cm. broad, the upper ones slightly smaller, the two of the terminal pair quite free at the base. *Male spadix* very long (about 2 met., Blume), ultradecompound; partial inflorescences numerous, elongate; the one seen by me with about 10 branchlets on each side; primary spathes . . . . . ; secondary spathes finely longitudinally striate, tubular, elongate, infundibuliform, subclavate, closely sheathing, obliquely truncate, and entire ciliolate at the mouth, prolonged at one side into a triangular erect acute point, armed with very small black-tipped scattered claws; branchlets of the partial inflorescences spreading, inserted above the mouth of their own spathes with a distinct axillary callus; the lowest, the largest, about 10 cm. long, with 8–9 spikelets on each side; tertiary spathes (spathes of the branchlets) unarmed or nearly so, narrowly tubular-infundibuliform, closely sheathing, truncate and entire at the mouth, prolonged at one side into a short patent or deflexed point; spikelets filiform, inserted at the mouth of their own spathes with a distinct axillary callus, strongly deflexed, the largest, the lowest, 2 cm. long with 14–15 very approximate flowers on each side; upper spikelets barely shorter; spathels bracteiform, concave, broadly ovate, glabrous, strongly striately veined, the point acute deflexed; involucre subringent, concave, shallow, obsoletely posticously bidentate, pushing down its own spathel and laterally attached to the base of the one above. *Male flowers* . . . . . *Female spadix* and *fruit* unknown.

HABITAT.—The volcanic mountains of Barangrang and Tankubang Prahu in the Province of Preanger in West Java, *Blume.*

OBSERVATIONS.—Of the authentic specimen of this I have seen a portion of a male spadix totally stripped of its flowers and a portion of a leaf without its sheath and therefore I am unable to make a precise comparison with some Sumatran specimens which I consider however as belonging to a distinct variety.

C. spectabilis is doubtless related to *C. rhomboideus*, but it is easily distinguished by its smaller dimensions, ultradecompound male spadix with much smaller flowers, and the smaller leaflets with only 5–7 costae of which 3–4 are bristly above.

CALAMUS SPECTABILIS var. SUMATRANUS Becc.

DESCRIPTION.—Scandent, fugaciously furfuraceous in the younger parts, then glabrous. *Sheathed stem* 10–12 mm. in diam. *Leaf-sheaths* slightly gibbous above, flagelliferous, glabrous, yellowish-brown when dry, densely armed with very unequal, small, rather broad, laminar, light, horizontal or slightly deflexed spines, of which the largest 7–8 mm. long, and these intermingled with much smaller and sometimes tuberculiform ones. *Ocrea* exsuccous, brittle, smooth or slightly spinulous. *Leaf-sheath flagella* filiform, very slender, armed even in the lower portion with very minute scattered (not whorled) claws. *Leaves* not cirriferous, 60–70 cm. long, with 4–5 inequidistant not fascicled remote leaflets on each side; petiole very short or almost obsolete; rachis rather acutely bifaced above and finely irregularly clawed in its upper portion, obsoletely angular near the base where armed almost all round with short conic straight or slightly hooked prickles; leaflets oblong-obovate or ovate-subrhomboid, glabrous and subconcolorous on both surfaces, papyraceous, rather thin in texture, acute and not ansate at the base, suddenly narrowed at the summit into a bristly tip, with 5–7 rather slender costae radiating from the base, of which only the central reaching the summit and the side ones curved and evanescent near the margins at different levels, 3–4 of them very finely inconspicuously remotely spinulous, the largest 18–20 cm. long, 6 cm. broad, the two of the terminal pair somewhat shorter and slightly narrower, those near the base very spreading, sometimes narrower but not very different from the others.

HABITAT.—W. Sumatra at Sungei Bulu in the Prov. of Padang in the low land not very far from the sea coast, *Beccari* P. S. 894, collected in Sept. 1878; also on Gunong Trang in the Lampong, *Forbes* Nos. 1574 and 1490 in Herb. Calc.

OBSERVATIONS.—The No. 1574 of Forbes is accompanied by the detached portion of a fruit-spadix which has a very long partial inflorescence with many remote deflexed spikelets and small obovate distinctly beaked fruits. As this specimen though bearing the same number as the leaves appears of a different gathering, I have not included it in my description. My Sumatran specimens and especially Forbes's ones bear a considerable resemblance to certain forms of *C. javensis*, but in this species all the primary nerves reach the summit of the leaflets.

PLATE 138.—Calamus spectabilis *var.* sumatranus *Becc.* Summit of the stem with a flagelliferous leaf-sheath and with an entire leaf; the base of a spadix; the summit of the spadix with an entire partial inflorescence (that mentioned above) and bearing immature fruit.—From Forbes's No. 1574 in the Berlin Herb.

116. CALAMUS BOUSIGONII Pierre MS. (name only) Becc. in Rec. Bot. Surv. Ind. ii, 209.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 10–12 mm. in diam.; naked canes yellowish, almost opaque, longitudinally striate, 6–8 mm. in diam. *Leaf-sheaths* elongate, slightly gibbous above, green marbled with furfuraceous patches, densely armed with small numerous scattered horizontal or slightly deflexed dark-brown fine subulate spines which rest on a swollen base and are about 1 cm. long at most and sometimes almost tuberculiform. *Leaf-sheath flagella* filiform, elongate (1·5 m.), compressed in their lower portion where acute and aculeolate on the margins, armed upwards with simple or 3-nate claws. *Ocrea* very short, obliquely truncate. *Leaves* relatively short, 75–85 cm. long, not cirriferous, with very few (11–13 in all) leaflets; petiole 15–20 cm. long, flattish above, rounded and clawed beneath, the margins armed near the base with straight spines; rachis bifaced above in its upper portion and sparsely clawed below; leaflets remotely inequidistant, irregularly alternate, subovate-rhomboid, cuneately attenuate, symmetric and acute at the base, shortly and suddenly acuminate at the summit into a bristly tip, papyraceous, rather firm, quite glabrous, opaque, green, and with a few brown polished longitudinal stripes on both surfaces, slightly paler beneath with 5–7 radiately divergent naked (not bristly or spinulous) costae of which the mid-costa only reaching the summit and the side ones arched near the margins and evanescent at different levels; secondary nerves slender; transverse veinlets sharp, numerous, approximate, continuous and subparallel; margins slightly undulate from the middle upwards, bristly-spinulous near the summit; some of the largest leaflets 20 cm. long, 8·5 cm. broad; in one leaf the intermediate ones 15 cm. long, 6 cm. broad; the upper ones slightly smaller; the two of the terminal pair quite free at the base, 9–10 cm. long, 3 cm. broad. *Male spadix* . . . . . *Female spadix* flagelliform, not very elongate, straight (not seen entire) and rigid in its lower portion with few partial inflorescences; primary spathes tubular, elongate, closely sheathing, obliquely truncate at the mouth, strongly and densely spinous, the spines straight, similar to those of the sheath or in the upper spathes, somewhat hooked; partial inflorescences short (8–10 cm. long) erecto-patent with few spikelets; secondary spathes tubular, short, truncate, unarmed; spikelets 1·5–2·5 cm. long, slightly arched, spreading, with few (8–10) somewhat irregularly not flatly biseriate flowers; spathels shortly and broadly infundibuliform, 2–3 mm. long, narrowed to the base, glabrous, striately veined, entire and truncate at the mouth, acute at one side; involucrophorum sessile, concave, very shallow, laterally attached to the base of the spathel above its own; involucre cupular, obsoletely bidentate on the outer side; areola of the neuter flower broadly lunate, sharply bordered. *Female flowers* 4·5 mm. long, the calyx very broadly 3-toothed; the corolla one-third longer than the calyx, its segments ovate-lanceolate, rather obtuse, almost polished outside or indistinctly striately veined; staminal urceolum crowned by 6 triangular teeth. *Fruiting perianth* shortly pedicelliform. *Fruit* broadly ovoid, very suddenly beaked, about 18 mm. long, 14 mm. broad; scales in 18 series, broader than long, almost flat, very slightly channelled along the middle, subshining, straw-yellow, narrowly bordered with chestnut-brown, the point obtuse, the margins erosely toothed. *Seed* ovoid-oblong, rounded at both ends, about 1 cm. long, 7–8 mm. broad, covered with a very thin adherent integument, superficially and coarsely pitted all round; the chalazal fovea very shallow and small, above the centre on the raphal side; albumen bony, superficially ruminated; embryo basal.

HABITAT.—Lower Cochin-China; at Baria in the Muxoai mountains, *Pierre* No. 4836, August 1866.

Observations.—This bears a great resemblance to *C. spectabilis* and to the smaller forms of *C. tomentosus* in the size and shape of the leaflets, but the petiole is elongate and flat above in *C. Bousigonii* while it is roundish in *C. tomentosus* and almost wanting in *C. spectabilis.* The leaf-sheaths are also very differently armed in the 3 species mentioned. Probably noteworthy differences also exist in the reproductive organs were these completely known in all the species of this group which is very characteristic by its leaflets resembling those of some species of *Korthalsia* and by the radiate disposition of their numerous primary nerves of which only one attains the summit and the others become evanescent on the margins at different levels.

Plate 139.—Calamus Bousigonii *Pierre.* Summit of the plant with an entire leaf; the base of a fruit-spadix and a flagellum, an intermediate portion of a sheathed stem (on the right-hand side); portion of the scaly pericarp of a fruit; seed from dorsal and raphal side and in longitudinal section.—From Pierre's specimens in Herb. Becc.

117. Calamus heteracanthus Zipp. in Bijdr. Nat. Weten. v, 178; Macklot in Bull. Sc. Nat. xxiv, 67; Bl. Rumphia iii, 56; Miq. De Palm. 29; H. Wendl. in Kerch. Les Palm. 236; Becc. Malesia i, 87 and in Rec. Bot. Surv. Ind. 210.

Daemonorops heteracanthus Bl. l. c. pl. 139; Walp. Ann. iii, 48 and v, 829; Miq. Fl. Ind. Bat. iii, 101; Becc. Malesia i, 87, 96.

Description.—Scandent. *Unsheathed canes* 10-15 mm. in diam. (Blume). *Leaf-sheaths* flagelliferous (Blume), woody, gibbous above, stamped with the impressions left by the spines during the praefoliation; the spines themselves 12–20 mm. long, scattered or confluent and transversally seriate, spreading, pale-fuscescent, intermixed with confluent pectinate criniform prickles (Blume). *Ocrea* densely aculeate. *Leaves* rather large, cirriferous; petiole . . . . .; rachis in the intermediate and upper portion slightly convex and at not very regular intervals (15–25 mm.) armed beneath with rather stout solitary or ternate claws, obtusely and asymmetrically bifaced above; leaflets not very numerous, patent, pointing in different directions, with a distinct axillary callus at their insertion, approximate on each side, into often opposite pairs, these remote, with vacant spaces 16–18 cm. long, green and shining on both surfaces, papyraceous, rather firm, narrowly oblong-spathulate, 21–25 cm. long, 4·5–6 cm. broad, conspicuously concavo-convex or cochleariform, gradually tapering towards the base, this acute, suddenly contracted at the summit into a short acuminate tip which is furnished with a few black bristles at the top and at the margins longitudinally plicate chiefly near the base, provided with 5 primary nerves or costae, all reaching the summit, less prominent beneath and completely naked on both surfaces; transverse veinlets very sharp, numerous, approximate, subparallel and continuous, almost equally prominent on both surfaces; margins quite smooth, the lower one of the upper surface bordered with a narrow polished band. *Male spadix* ultradecompound, 1–1·3 m. long (Blume); partial inflorescences ascendent loosely panicled, narrowly pyramidate; the one seen by me is 30 cm. long and bears 4–5 gradually diminishing branchlets on each side; primary spathes . . . . .; secondary spathes loosely sheathing the slightly sinuous main-axis rigid, tubular-infundibuliform, membranous, exsuccous, unarmed, very finely striately veined, fugaciously scaly-furfuraceous, almost horizontally truncate and naked at the mouth, slightly prolonged at one side into a short acute point; the lower branchlets, the largest, 8–9 cm. long, somewhat arched-patent or even deflexed, inserted above the mouth of their own spathes, with 6–7 spikelets on each side and prolonged at the summit into a simple slender, filiform spikelet, this longer than the side ones; tertiary spathes similar to the secondary ones but smaller and more horizontally truncate; spikelets very slender, filiform, inserted above the mouth of their own spathe with a small axillary callus, the lower ones the largest, 2·5 cm. long with 12–14 flowers irregularly arranged in two series and not flatly bifarious; the upper ones speedily smaller; the extreme with a flower alone; spathels tubular-infundibuliform, strongly striately veined, truncate and entire at the mouth, apiculate at one side; involucre slightly prominent but not pedicellate, laterally attached outside its own spathel at the base of the one above, with a distinct waxy callus at the axilla next to the axis, discoid with a narrow scale-like margin. *Male flowers* irregularly ovate-oblong, usually somewhat narrowed to the base, often asymmetric and obsoletely angular by mutual pressure, obtuse, 4 mm. long; the calyx short, obconic-campanulate, membranous, strongly striately veined, with 3 broadly triangular acute teeth; the corolla 3 times and even more as long as the calyx, divided into 3 oblong, obtuse or apiculate, strongly striately veined segments. *Female spadix* and *fruit* unknown.

HABITAT.—The S. W. coast of New Guinea, *Zippel*, according to Blume.

OBSERVATIONS.—I have seen only one incomplete specimen, apparently the one figured by Blume, of this highly characteristic but imperfectly known species not found again by modern botanists. The description above of the leaf-sheath and ocrea is from Blume as I have not seen these parts. The male flowers by their small calyx and asymmetric long corolla call to mind those of some *Arecineæ*, and the leaflets elongate-spathulate, cochleariform, green, sharply and closely transversally veined on both surfaces and very approximate in couples on each side of the rachis, distinguish this *Calamus* from the allied species; probably it approaches *C. Cumingianus* more than any other species.

PLATE 140.—Calamus heteracanthus *Zipp.* An intermediate portion of a leaf portion of the male spadix with an entire partial inflorescence; two detached branchlets with male flowers.—From the authentic specimen in the Leyden Herb.

118. CALAMUS SYMPHYSIPUS.—Mart. Hist. Nat. Palm. iii, 336; Walp. Ann. iii, 487 and v, 831; Miq. Fl. Ind. Bat. iii, 124 and De Palm. Arch. Ind. 27; H. Wendl. in Kerch. Les Palm. 238; Becc. in Rec. Bot. Surv. Ind. ii, 210.

DESCRIPTION.—Scandent, rather robust. *Sheathed stem* probably 3–4 cm. in diam *Leaf-sheaths* armed with few not very large spines in a small portion from near the base of the petiole which I have seen. *Leaves* probably about 2 metr. long, not cirriferous, or terminating in much reduced leaflets and subcirriferous; petiole rather robust, about 15 cm. long, 13 mm. thick, almost flat or broadly and superficially channelled above, round and smooth beneath, armed at the sides with unequal horizontal short (1–8 mm. long) spines, 2–3 of them often confluent by their broad bases; rachis bifaced above from the middle upwards, rounded in the lower surface in the intermediate portion, where armed at regular intervals along the middle and irregularly along the margins with solitary claws, these ternate and gradually smaller towards the summit; leaflets numerous, remotely inequidistant, but apparently not fascicled, though whereas a few are regularly set 3–4 cm. apart one from the other, the following may be 10 cm. distant, elliptic-lanceolate or oblanceolate, gradually narrowed to and acute at the base, acuminate at the summit, the extreme narrow tip covered with short brown subspiny bristles, papyraceous, rather firm, with 6–7 slender costæ, these almost of equal strength and all reaching the summit, without bristles or spinules on either surface, green, glabrous and subshining above, discolorous underneath, where covered with a very thin and very adherent light sub-ochreous coating; transverse veinlets crowded and continuous, more sharp above than beneath; margins closely and adpressedly spinulous; the largest leaflets, those of the lower and intermediate portion, 28 cm. long, 5 cm. broad, the upper ones speedily decreasing in length, the uppermost only 6–10 cm. long and 10–15 mm. broad. *Male spadix* . . . . . *Female spadix* rather large and elongate (not seen entire) with many not very remote (18–20 cm. apart) partial inflorescences and prolonged into a strongly clawed flagellum, this 1 metre in length in one specimen seen by me; lowest primary spathe not seen; upper primary spathes tubular-cylindraceous, thinly coriaceous, slightly enlarged and loosely sheathing in their upper part where the largest, those of the lower portion of the spadix, 12–15 mm. in diam., obliquely truncate and prolonged at one side into a short broad point at the mouth, sparingly armed chiefly on the back of their upper part with very small subtuberculiform spines; partial inflorescences arising erect from inside their respective spathes, then arched, rather short, the lower ones, the largest, about 20 cm. long, not very dense, with 10 spikelets on each side; secondary spathes tubular-infundibuliform, rather loosely sheathing, slightly obliquely truncate and naked at the mouth, apiculate at one side, quite unarmed, faintly striately veined; spikelets inserted above the mouth of their own spathe with a distinct axillary callus, spreading, arched scorpioid, their axis rigid, filiform, gradually narrowed towards the apex or subulate with two not flatly bifarious but slightly assurgent and not very regular series of flowers; the largest spikelets 10–12 cm. long with 15–16 flowers in each series; spathels more or less fugaciously furfuraceous, elongate-infundibuliform, loosely sheathing, finely striately veined, horizontally truncate and entire at the mouth, shortly apiculate at one side, gradually smaller from the base of the spikelet to the summit; involucrophorum small, flat, discoid, stalked by a slender pedicel, this 2–4 mm. long and attached outside its own spathel near the base and sometimes about to the middle of the one above, more or less distinctly callous at its axilla; involucre slightly raised above the involucrophorum, disciform, subconvex with a narrow annular limb; areola of the neuter flower punctiform. *Female flowers* small, 3 mm. long. *Fruiting perianth* shortly but distinctly pedicelliform, the calyx shortly cylindraceous, finely striately veined, teeth patent, very broadly triangular, apiculate; segments of the corolla as long as the teeth of the calyx, but a half narrower. *Fruit* sphæric, 1 cm. in diam., very shortly mucronulate, scales small, numerous, in about 24 series, subshining, slightly channelled along the middle, slightly prolonged into a rather obtuse and not very adpressed tip, light-yellowish with narrow paler scarious erosely toothed margin. *Seed* orbicular, somewhat compressed, 6–7 mm. broad, 3·5 mm. thick, with a small round deep chalazal fovea in the centre of the raphal side, covered with a thin crustaceous (once fleshy) detachable integument, otherwise with even, not pitted, surface; albumen equable; embryo lateral in the centre of the face opposite the chalazal fovea.

HABITAT.—Celebes: in the Strait of Bouton collected by Labillardière (Paris Herb. and Herb. Webb at Florence). To this species apparently belongs the specimen of a leaf collected by Warburg at Bajong in the prov. of Minahassa in N. Celebes, where it receives the native name of "Rotang embel."

OBSERVATIONS.—My description is taken from the type-specimens seen by Martius himself consisting of some portions of leaves and of an incomplete spadix, with mature fruit. This is in all respects a very well marked species distinguishable at once, even when out of flower, by its large many-costate elliptic-lanceolate discolorous leaflets, of a light-yellow subochraceous colour underneath; and by the conspicuously pedicellate involucrophorum, a character which it has in common with the other species of the group to which it belongs. Its nearest ally seems to be *C. Cumingianus*, which has also the female flowers stalked by a similarly elongate involucrophorum.

PLATE 141.—Calamus symphysipus *Mart.* The base and the summit of a leaf; portion of the spadix with mature fruit; fruits and seeds.—From the authentic specimen in Webb's Herbarium at Florence.

119. CALAMUS CUMINGIANUS Becc. in Rec. Bot. Surv. Ind. ii, 210.
Calamus sp. Vidal Phan. Cuming. (No. 762), 18 and 154.

DESCRIPTION.—Probably scandent. *Leaf-sheaths* . . . . . *Leaves* (not seen entire by me) probably cirriferous; petiole . . . . . ; rachis (in a small portion, probably from about the middle of the leaf) longitudinally finely striate on both surfaces, rounded below, where armed along the middle and at the sides with rather robust solitary black-tipped claws, unequally bifaced above and spinulous on its upper angle; leaflets approximate into groups of 2–4 on each side, the groups alternate, oblong-oblanceolate or oblong-subspathulate, slightly concavo-convex or subcochleariform, cuneately attenuate to the base, 20–24 cm. long, 5–5·5 cm. in width in their broadest part near the summit which is suddenly contracted into a short triangular tip, this furnished with short rigid black bristles at the margins, papyraceous, green, opaque and glabrous on both surfaces, but paler beneath, longitudinally plicate, 7–9-costate, the mid-costa slightly the strongest and with very small and distant spinules throughout in the upper surface; side costae slender and naked; on the lower surface the mid-costa and the side-nerves almost more distinct than above, and all naked; transverse veinlets very approximate and numerous but not very sharp; the margins closely serrate-spinulous; the lower margin on the upper surface bordered with a polished band, a few other similar polished bands or stripes (1–4 mm. broad) occur also, sometimes along the main-nerves and correspond to the exposed portions of the blade in the praefoliation. *Male spadix* . . . . *Female spadix* ultradecompound (not seen entire), apparently elongate; upper primary spathes thinly coriaceous, elongate, cylindraceous, not very closely sheathing, shortly open at the summit on the ventral side and prolonged into a short acute point, fugaciously furfuraceous, sparingly armed with scattered, very small, short slender and scattered prickles; partial inflorescences arising erect from inside their own spathes, then arched, loosely panicled-pyramidate, subscorpioid; the one seen by me 15 cm. long, bearing at its base a few branchlets (or branched spikelets) 5-6 cm. long and higher up 3-4, gradually diminishing, simple spikelets; secondary spathes thin in texture, almost membranous, infundibular, loosely sheathing, finely striately veined, fugaciously furfuraceous, ciliate, truncate and obsoletely 3-dentate at the mouth; spikelets very unequal, with very slender and brittle axes, the lower ones, the largest, 2–2·5 cm. long, with very few remote flowers on each side, the upper ones shorter and very few-flowered; spathels membranous, fugaciously furfuraceous, infundibuliform, narrow at the base, broadened and loosely sheathing in their upper part, very finely and sharply veined, truncate and acute at one side at the mouth; involucrophorum small, calyculiform, propped by a slender pedicel 1–2 cm. long, attached at the mouth of its own spathel at the base of the one above; involucre slightly raised above the involucrophorum, larger than this, calyculiform, more or less acutely bidentate on the outer side; areola of the neuter flower punctiform, often furnished with a small bracteiform scale. *Female flowers* ovate, 3 mm. long; the calyx thin, submembranous, ovoid-urceolate, sharply striately veined, superficially and broadly 3-toothed; the corolla barely longer, divided down to the middle into 3 broad triangular acute thin connivent segments; stamens with the filaments united by their bases into a high membranous urceolum which reaches to or above the middle of the corolla and is truncate and crowned by 6 separate (not in contact by their slightly broadened bases) linear short teeth; sterile anthers deeply sagittate; ovary obovate, tapering towards the base; style 0; stigmata thick elongate-triangular, lamellose-tubercled inside, spreading during anthesis. *Neuter flowers* slender, 3·5–4 mm. long; the calyx subcampanulate, broadly 3-toothed, the corolla twice and half as long as the calyx, both finely striately veined. *Fruit* unknown.

HABITAT.—The Philippines: in the Province of Tayabas in Luzon, *Cuming* No. 762 in Herb. Kew.

OBSERVATIONS.—The description is taken from the specimen of an intermediate portion of a leaf and a portion with only a partial inflorescence of a female spadix in flower. Notwithstanding these scanty materials, the species appears a very distinct one, only related to *C. symphysipus* and *C. heteracanthus* and easily distinguishable by its spathulate, opaque, not discolorous, many-costate leaflets, which are clustered into alternate groups of 2–4 on each side of the rachis and by the female flowers with a long-stalked involucrophorum.

PLATE 142.—Calamus Cumingianus *Becc.* An intermediate portion of a leaf; portion of the female spadix in flower with an entire partial inflorescence.—From Cuming's No. 762 in Herb. Kew.

120. CALAMUS VITIENSIS Warb. MSS. (name only in the Berlin Herbarium).

DESCRIPTION.—Scandent, slender or of moderate size (Weber). *Leaf-sheaths* . . . . . *Leaves* 1–1·2 m. long (Weber), apparently cirriferous; leaflets not numerous, very inequidistant and remote, not fascicled, alternate or subopposite, thinly papyraceous or subherbaceous, green even when dry, concolorous on both surfaces, explanate, lanceolate, almost equally narrowed to both ends, inserted at a rather acute angle and not callous at their upper axilla, not very long-acuminate at the summit into a not very acute tip, with 5 very slender costae completely naked on both surfaces; transverse veinlets short, not very close together and much interrupted; margins very acute, quite smooth except very near the summit, where finely spinulous; the largest leaflets, the lowest of a terminal portion (the only one seen by me), 22–25 cm. long and 35–36 mm. broad, the others gradually shorter, the uppermost very small (8 cm. long, 17 mm. broad); rachis acutely bifaced above, flattish beneath, where armed at intervals of 2–3 cm. with half-whorls of relatively strong not very acuminate black-tipped claws. *Male spadix* . . . . . *Female spadix* not very elongate, rather stout, with few partial inflorescences; primary spathes tubular, not very closely sheathing, thinly coriaceous, the lowest amongst those extant in the specimen seen by me, but not actually the first, cylindraceous truncate at the mouth, prolonged at one side into a short triangular point, this slightly keeled and with a few scattered small tuberculiform spinules on the back upper primary spathes gradually smaller, cylindraceous, striate, ultimately decayed but not filamentose at the mouth, quite unarmed, suddenly narrowed at their base into a slender, unarmed, flattened, sub-biconvex and acutely edged axial portion; the intermediate spathes about 15 cm. long and 10–12 mm. broad in their larger sheathing portion; partial inflorescences not very diffuse, panicled, arising erect from their respective spathes and then spreading, arched or recurved, their axis robust at the base, slender and filiform at the summit, rather short with many very approximate subtrifarious or (at least at the base) not exactly distichous spikelets, which very suddenly decrease in length from the base of the inflorescence to its summit; secondary spathes short, tubular, infundibuliform or cyathiform, loosely sheathing, unarmed, finely striate, horizontally truncate and entire at the mouth, not or slightly apiculate at one side; spikelets inserted outside the mouth of their own spathe with a rather distinct axillary callus, their axis slender, rigid and narrowing towards the summit, arched, patent, horizontal or deflexed; the lower ones, the largest, 6–7 cm. long with 13–15 flowers on each side; the uppermost very small with 1–2 flowers only; spathels very narrow at their base with a suddenly enlarged, shortly infundibuliform, striolate, truncate, entire, not or slightly apiculate limb; involucrophorum laterally attached near the base of the spathel above its own, distinctly pedicellate in the lower part of the spikelets, subsessile towards their summit, orbicular-disciform with a narrow entire limb involucre flat, also orbicular-disciform and as large as the involucrophorum; areola of the neuter flower depressed, callous; the flowers are not always perfectly bifarious in one plane but are slightly assurgent on the subscorpioid spikelets. *Fruiting perianth* pedicelliform; the calyx shortly tubular with a quite flat base and 3 broadly triangular spreading lobes; the segments of the corolla slightly narrower than the lobes of the calyx and as long as these. *Fruit* apparently globular and about 1 cm. broad; scales rather shining, strongly convex not or very faintly channelled along the middle, yellowish with darker tip.

HABITAT.—In the small Island of Taviuni of the Fiji group at 1,200 metr. above the level of the sea, *Weber* Oct. 1881, No. 111, in the Berlin Herb.

OBSERVATIONS.—I have seen of this some portions of a fruit-spadix, but of the fruit only fragments of the scaly pericarp without the seed and the upper portion (36 cm. long) of a leaf with only 3 leaflets on each side and without the summit which is probably cirriferous, its uppermost leaflets being much reduced in size and more distant than the lower ones as is usually the case with that kind of leaf. It has not very prominent characters but it is distinct in the group, by its concolorous, inequidistant, remote, not fascicled, narrowly lanceolate 5-costate leaflets the costae smooth on both surfaces and the margins also smooth except at the summit. It is the most easterly species of the genus, and I dare say of the entire group of *Lepidocaryeae* except *Sagus.* In its chief characters it would appear to have some resemblance to *C. kandariensis.*

PLATE 143.—Calamus vitiensis *Warb.* The summit of a leaf (under-surface); portion of the female spadix.—These parts represent the entire type-specimen in the Berlin Herb.

121. CALAMUS KANDARIENSIS Becc. in Rec. Bot. Surv. Ind. ii, 210.

DESCRIPTION.—Scandent, rather slender. *Sheathed stem* 8–10 mm. in diam. *Leaf-sheaths* strongly gibbous above, very obliquely truncate and naked at the mouth, finely longitudinally striate, covered with an ashy soft cottony-furfuraceous easily detachable indumentum and scantily armed with a few small short straight horizontal spines or also altogether smooth; no leaf-sheath flagella in the specimens seen by me. *Ocrea* very short, indistinct. *Leaves* terminating in a rather long and very slender cirrus; this armed with scattered or ternate very sharp small claws; petiole short, 5–6 cm. long, flat above, convex beneath, where armed with a few solitary claws; rachis smooth and bifaced above, armed beneath with claws which are solitary in its first portion and ternate upwards; petiole and rachis fugaciously cottony-furfuraceous; the pinniferous part 45–50 cm. long; leaflets very few, patent or almost horizontal, very inequidistant, usually closely approximate into 4–6 distant pairs on each side, the pairs of one side alternate with or opposite to those of the other side, narrowly lanceolate or oblanceolate, flat or very slightly concavo-convex, usually almost equally narrowed to both ends, acute at the base, gradually acuminate at the summit into a long subulate tip, thinly papyraceous, subshining and of an uniform brown colour (when dry) on both surfaces, unicostate or very obsoletely 3–5-costate, the mid-costa very slender and the other costae still more slender and inconspicuous; all naked on both surfaces; transverse veinlets sharp, approximate and interrupted; margins quite smooth even at the extreme apex; the largest leaflets, those about the middle, 20–22 cm. long, 2–2·5 cm. broad, the lowest and the uppermost slightly smaller. *Male spadix* slender, 60 cm. long, straight at the base and nodding at the summit, inserted about the middle of the sheath (not near its mouth), with few small and remote partial inflorescences (4 in one specimen); primary spathes more or less covered with greyish and rusty thin fugacious scurf, elongate-tubular, papyraceous, rather closely sheathing, entire and obliquely truncate and naked at the mouth, where very slightly prolonged at one side into a short point; the lowest shorter and smaller than the upper ones, very faintly keeled at both sides, unarmed; the upper ones very feebly aculeolate on the back or quite smooth, cylindraceous, very suddenly narrowed into the slender flattened angular unarmed axial part; partial inflorescences attached outside the mouth of their own spathe with a distinct axillary swelling, slightly branched; secondary spathes tubular-infundibuliform, truncate and acute at one side at the mouth, finely striately veined; spikelets very short, with very few assurgent not flatly bifarious flowers; spathels infundibuliform, finely striately veined, truncate at the mouth; involucre discoid, flat, obsoletely toothed, sessile, almost horizontally subtended by its own spathel and attached at the base of the one above. *Female spadix* and *fruit* unknown.

HABITAT.—S. E. Celebes, where I collected this species in July 1874 near Kandari.

OBSERVATIONS.—This species is described from specimens consisting of some portion of the sheathed stem with entire leaves and with a male decayed spadix wanting the summit, but apparently not cirriferous, stripped of the flowers; it is nevertheless distinguishable without difficulty by its cirriferous leaves, the leaflets lanceolate very acuminate, paired on each side of the rachis; the pairs usually opposite and remote; further, the many-costulate leaflets have the costae very inconspicuous and like the margins totally devoid of bristles, hairs, or spinules. It has not very marked affinities, though evidently related to *C. adspersus.* It is perhaps the one which more than any other approaches *C. vitiensis.*

PLATE 144.—Calamus kandariensis *Becc.* Portion of the sheathed spadix bearing a decayed female spadix.—The type-specimen in Herb. Becc.

CALAMUS KANDARIENSIS var. GLABRATUS Becc. in Rec. Bot. Surv. Ind. ii., 210.

DESCRIPTION.—Glabrous, leaf-sheaths sharply and finely striately veined, armed with rather many straight horizontal short or even 15 mm. long spines; petiole longer and more powerfully armed than in the type, some of the spines on the margins straight and 10–15 mm. long; leaflets more numerous and narrower.

HABITAT.—Celebes: at Kandari, with the type.

OBSERVATIONS.—Not taking into account its baldness, the other peculiarities mentioned above probably depend upon the youthful age of the plant from which the specimens were gathered, this not having as yet produced spadices.

PLATE 144.—Calamus kandariensis *Becc.* Portion of a sheathed stem (sterile); on the left side of the plate.—The type-specimen in Herb. Becc.

122. CALAMUS ADSPERSUS Bl. Rumphia, iii, 40 (excl. syn. Rumph.) and pl. 142 (excl. fig. D. and analysis) and pl. 143 (with the name of *Dæmonorops*); Mart. Hist. Nat. Palm. iii, 340; Walp. Ann. iii, 490, and v, 832; Miq. Fl. Ind. Bat. iii, 131, and De Palmis, 28; Teysm. Cat. Hort. Bog. 74.

C. oblongus (non Reinw.) Mart. Hist. Nat. Palm. iii, 207 (first edit.), partly as to descript. and pl. 160, fig. iv (only as to the leaf-sheath and lower portion of the leaf).

C. oblongus var. *β* Bl. in Rœm. et. Schult. Syst. Veg. vii, II, 1324 (excl. *Palmij. gramin.* Rumph.)

C. asperrimus (not of Bl.) Zolling. Syst. Verzeich. 79 and Exsic. No. 2302 (in Herb. Boiss.) at least as to ♀ spad. and fruit.

C. adspersus Bl. var. *intermedius* and var. *fructibus minoribus*, Teysm. Cat. Hort. Bog. 74.

Daemonorops adspersus Bl. Rumphia iii, pl. 143.

DESCRIPTION.—Very high scandent and rather large, up to 60 m. in length (Bl.). *Sheathed stem* 2·5–4·5 cm. in diam. *Leaf-sheaths* (not flagelliferous) strongly gibbous above, armed with numerous unequal, straight and rather short (1–6 mm.) spreading or horizontal scattered or subseriate spines; the mouth obliquely truncate and densely hispid-spinous. *Ocrea* very short or indistinct. *Leaves* of the upper and fertile part of the plant cirriferous, fugaciously rusty-furfuraceous mainly on the rachis, the pinniferous part 1·8–2·5 m. long, the cirrus itself ·6–1m. long (Bl.), densely and somewhat irregularly armed with half-whorled claws; petiole rather short, 6–15 cm. long, 10–15 mm. thick, rounded below, flat above, more or less armed with very short spines on both surfaces and at the margins; rachis bifaced and smooth above, clawed beneath, where the claws are solitary in the first portion, ternate or half-whorled upwards; leaflets rather numerous, sub-equidistant, 18–20 on each side, 5–6 cm. apart and even more distant towards the summit, very narrowly lanceolate, 30–40 cm. long, 20–27 mm. broad, papyraceous, rigidulous, green above even when dry, pale or subglaucescent beneath, tapering towards the base, gradually and subulately acuminate at the apex, rather acutely 3 costae, sometimes with an additional naked and strong nerve on each side; the 3 costae furnished above with rather strong, 3–5 mm. long, spadiceous bristles; beneath all the nerves tenuous and naked; margins acute and, mainly near the apex, rather densely and conspicuously ciliate with spreading bristles. *Male spadix* . . . . . *Female spadix* decompound, apparently axillary, 2–2·7m. long, nodding, with 10–13 spreading and arched partial inflorescences; lowest primary spathe about 20 cm. long, compressed, two-keeled, tubular, closely sheathing, truncate at the mouth, armed mainly in their upper part with short scattered rather closely set spines; upper primary spathes rusty-furfuraceous in youth, ultimately glabrous, tubular, cylindraceous, slightly enlarged above, sprinkled with very slender subsetiform spadiceous horizontal or deflexed spines which are 5–7 mm. long and rest on a callous bulbous base; partial inflorescences (only one seen by me) 15 cm. long, with 6-7 spikelets on each side; secondary spathes rather short, infundibuliform, covered with a tobacco-coloured scaly-furfuraceous scurf, sharply veined, unarmed, entire truncate and ciliolate at the mouth, slightly prolonged at one side into an acute point; spikelets arched, slender, flexuose, inserted above the mouth of their own spathe; the lower ones, the largest, 7–8 cm. long, with two assurgent (not flatly bifarious) series of 8–10 flowers each; upper spikelets gradually shorter; spathels infundibuliform, loosely sheathing, gradually narrowed to the base, truncate, entire at the mouth, obsoletely apiculate at one side; involucrophorum laterally attached at or above the base and sometimes about to the middle of the spathe above its own, with a distinct axillary callus, pedicelliform, enlarged above into a subtrigonous cupular-calyciform truncate entire limb; involucre slightly exceeding the involucrophorum, shallowly cupular truncate and entire, bearing at one side a distinct cylindraceous pedicel (1·5–2 mm. long) for the neuter flower. *Female flowers* subcylindraceous, 4 mm. long, 1 5 mm. thick; the calyx tubular, finely striately veined, shortly and acutely 3-toothed; the corolla slightly shorter than the calyx, its segments acute; staminal urceolum crowned by 6 triangular teeth; anthers sagittate; ovary obovoid-oblong with short stigmas. *Fruiting perianth* distinctly pedicelliform. *Fruit* disposed in two assurgent series or with a secund arrangement, globose, 13–14 cm. in diam., rounded at both ends, topped by a small conic beak; scales in 18 series, shining, dirty straw-yellow, rather deeply channelled along the middle, with a slightly prolonged and dark-coloured tip, the margins finely erosely toothed. *Seed* globular, very slightly compressed, rounded at both ends, 1 cm. long, 8 mm. broad, coarsely and broadly pitted when cleaned from the dry brittle crustaceous, once fleshy integument, with a very narrow and deep but inconspicuous chalazal fovea in the centre of the raphal side; albumen bony, subruminate by the intrusion of the integument into the pits of the surface; embryo basal.

HABITAT.—Java. Blume says that it grows chiefly near the banks of the rivers in the dense forests at the foot of the volcanic mountains in the western part of the island. Zollinger collected his specimens distributed with the No. 2302 on Mt. Semiru, between 600–1,800 metres elevation.

OBSERVATIONS.—I have seen of the authentic specimens of Blume only the terminal part of a leaf. I have derived from Blume my description of the leaf-sheaths, which I have not seen, and the generalities of the leaves and of the spadix from Zollinger's specimens.

Figure V in plate 160 of the work of Martius, representing a leaf-sheath with a portion of the petiole and a few leaflets of *C. adspersus*, does not exactly agree with the corresponding parts of the same species in plate 143 of *Rumphia*.

The apical portion of a leaf accompanying the portions of spadix with female flowers and fruit of Zollinger's No. 2302 in Herb. Boiss. which I have described and photographed has the rachis armed with solitary claws almost to the summit, the leaflets are less bristly on the carinæ and the bristles on the margins are shorter and more adpressed than in the type-specimen. I have not seen specimens of the varieties mentioned by Teysmann.

C. adspersus approaches in its secund not flatly bifarious arrangement of the flowers and in the stalked flowers and fruit, *C. Cumingianus* and *C. symphysipus*; the seed, however, in this last is not at all ruminate, and the embryo is lateral, whereas the seed of *C. adspersus* has some intrusion of the integument and a basa embryo. Moreover *C. adspersus* is distinguishable by its distinctly cirriferous leaves with numerous subequidistant narrowly lanceolate leaflets which have the 3 costae in the upper surface and the margins bristly.

PLATE 145.—Calamus adspersus *Bl.* The summit of a leaf (upper surface); portion of a female spadix in flower with an entire partial inflorescence; another portion of a female spadix with mature fruit; seed from the dorsal side; seed cut through the embryo.—From Zollinger's No. 2302 in Herb. Boiss.

123. CALAMUS PLICATUS Bl. Rumphia iii, 67; Mart. Hist. Nat. Palm. iii, 339; Walp. Ann. iii, 489 and v, 831; Miq. Fl. Ind. Bat. iii, 130 and De Palmis 28; H. Wendl. in Kerch. Palm. 237; Becc. in Rec. Bot. Surv. Ind. ii, 210.

DESCRIPTION.—Rather slender and probably scandent. *Sheathed stem* apparently about 15 mm. in diam. The *leaf* upon which Blume has founded the species is 60 cm. long and bears a very small portion of its sheath, which is armed with small straight pale spines; petiole very short (3·5 cm. long) channelled above, rounded beneath, where armed—as the first portion of the rachis—at the sides and along the middle with relatively strong claws; in its upper part the rachis is bifaced above, not very regularly furnished beneath along the middle with small claws and prolonged beyond the last leaflet into a very slender filiform very short (2·5 cm. long) aculeolate rudimentary flagellum; leaflets not very numerous, 12 on each side, inequidistant, usually not remotely paired on each side of the rachis, the pairs of one side alternating with those of the other side, 13–15 cm. long, 15–18 mm. broad, narrowly oblanceolate, sub-spathulate, concavo-convex or spoon-shaped at their summit, where very suddenly contracted into a linear acuminate tip, this 15–20 mm. long and bristly-penicillate at the apex, gradually narrowed to the base, green, concolorous and glabrous (without bristles or spinules) on both surfaces, deeply longitudinally plicate and with about seven equal slender costae; transverse veinlets rather distinct, much interrupted; margins smooth or with a very few very adpressed spinules, the lower one bordered by a shining band 1–3 mm. broad; the two terminal leaflets not opposite. Of these the uppermost, the smallest; those near the base narrower than the upper ones. Other parts unknown.

HABITAT.—Collected by Forsten in Celebes, as from Blume l. c.

OBSERVATIONS.—Known only by the specimen of one leaf which I have seen; I have not, however, observed at the mouth of its sheath the light brown bristles mentioned by Blume. Though so imperfectly known it seems to me to belong evidently to the group of *C. symphysipus*, and is distinct from the others by its narrowly spathulate concavo-convex, many-costate plicate leaflets. I believe, however, that the leaf upon which the species is founded belongs to a not fully grown plant.

PLATE 146.—Calamus plicatus *Bl.* The entire type-specimen in the Leyden Herbarium.

124. CALAMUS MINAHASSÆ Warb., name only in Herb. Berol.

DESCRIPTION.—Very slender, scandent. *Sheathed stem* 6–7 cm. in diam. *Leaf-sheaths* not cirriferous, covered like the spadix and leaf-rachis with a rusty-furfuraceous removable indumentum, longitudinally striate, gibbous above, obliquely truncate at the mouth, irregularly armed with slender, flat, subulate, unequal, scattered, dark, straight, slightly deflexed, 10–12 mm. long spines, with which are intermingled other very small, and sometimes sub-tuberculiform spinules. *Ocrea* very short, reduced to a short axillary ligule and to a narrow scabridous margin at the mouth of the sheath. *Leaves* delicate, cirriferous, 35–50 cm. long in the pinniferous part; the cirrus slender, filiform, elongate, armed with solitary or more or less aggregate slender claws; petiole short or very short (1–3 cm. long), flat above, where sometimes spinulous as on the first portion of the rachis, convex beneath, where armed with a few long and straight spines which upwards on the rachis are transformed into scattered unequal and sometimes very small claws; in its upper part the rachis is bifaced and smooth; leaflets not numerous (14–16 in all) inserted at an angle of 45°, distinctly approximate in distant pairs on each side, the pairs sub-opposite and therefore forming 4 very distinct groups of 4, separated by a long (8–10 cm.) vacant space; thinly papyraceous, rather rigid, somewhat plicate, chiefly at the base, otherwise explanate, green even when dry, subconcolorous, slightly paler beneath, oblanceolate, gradually narrowed and acute at the base, rather suddenly acuminate at the summit into a slender tip, this bristly spinulous at the margins, with 3–5 slender costæ which are almost equally prominent and naked on both surfaces and with 1–2 rather distinct secondary nerves between the main costæ; transverse veinlets very distinct, rather crowded; margins finely spinulous, the largest leaflets, the intermediate ones, 15–19 cm. long, 2–3 cm. broad, the uppermost and especially the lowest considerably smaller. *Male spadix* . . . . . *Female spadix* very elongate, slender, subflagelliform, simply decompound, with many small remote partial inflorescences; lowest primary spathe . . . . . ; upper primary spathes tubular, cylindraceous, very elongate, closely sheathing, obliquely truncate at the mouth, where prolonged at one side into a short erect point, suddenly narrowed at the base into the very slender filiform flattened obsoletely angular axial part, rather densely armed with very small deflexed prickles, which have a light swollen base and a brown tip or are tuberculiform or slender and subulate and even 1 cm. long; partial inflorescences 15–20 cm. apart, inserted at the mouth of their respective spathe with a distinct axillary callus, spreading, small, the largest 10–12 cm. long with 9–10 spikelets on each side; secondary spathes short, tubular-infundibuliform, more or less angular, somewhat loosely sheathing, entire, truncate and subscarious at the mouth, barely apiculate at one side, unarmed and finely longitudinally striate; spikelets inserted above the mouth of their respective spathes with a distinct axillary callus, recurved and subscorpioidly arched, the lower ones, the largest, 2·5–3 cm. long with 10–12 pairs of flowers; spathels narrow and more or less angular at the base, suddenly expanded above into a short broadly infundibuliform entire limb, which is prolonged at one side into a short usually deflexed point; involucrophorum laterally attached outside its own spathel at the base of the one above, sessile or with a short neck, suborbicular, discoid with a narrow and unequal margin; involucre also discoid, flat, orbicular; areola of the neuter flower callous-spongy. *Female flowers* in two series not disposed distinctly on one plane, but slightly turned upward, oblong, about 3 mm. in length; the calyx tubular, slightly inflated in the middle, finely striately veined, with 3 very short triangular acute teeth; segments of the corolla narrower and almost shorter than those of the calyx. *Neuter flowers* as long as but narrower than the female ones, with the calyx short, 3-gonous, acutely 3-dentate and the corolla a good deal longer than the calyx; the segments valvate and finely externally striate. *Fruiting perianth* distinctly pedicelliform. *Fruit* small, ovoid, distinctly suddenly mucronate, about 1 cm. long (including the mucro) and 6 mm. broad; scales in 17–18 series, reddish brown, slightly convex, not or slightly channelled along the middle, subshining, slightly prolonged into an obtuse point, with a relatively large dark intramarginal line; margins erosely toothed. *Seed* ovoid, about 6 mm. long, coarsely and irregularly pitted and grooved; the chalazal fovea narrow, in the centre of the raphal side; albumen equable, except for the superficial intrusions of the crustaceous integument; embryo basal.

HABITAT.—North Celebes, at Bojong in the Prov. of Minahassa, *Warburg* in Herb. Berol.

OBSERVATIONS.—A very near ally of *C. Cawa* (Rumph. Herb. Amb. pl. 57 fig. 1. A. B.) from which it differs in the grouped leaflets, and perhaps still more like *C. equestris* (Rumph. l. c. pl. 56) which has grouped leaflets, but apparently unarmed leaf-sheaths or nearly so. The discovery of this species permits us to establish the exact position and the affinities of the two last mentioned *Calami*, which have not been found again by modern botanists, but which I consider to be very distinct species which doubtless still grow in the localities given by Rumph.

PLATE 147.—Calamus minahassæ *Warb.* The summit of the plant with an entire leaf; portion of a sheathed stem; the summit of a female spadix in flower; portion of a fruit spadix.—From Warburg's specimen in Berlin Herbarium.

125. CALAMUS CAWA Bl. Rumphia iii, 31 (note 10) and 62 under *C. equestris;* Mart. Hist. Nat. Palm. iii, 342; Walp. Ann. iii, 491 and v, 832; Miq. Fl. Ind. Bat. iii, 138 and De Palmis 29; Becc. Malesia i, 88; H. Wendl. in Kerch. Palm. 239; Hasskarl. Neuer Schlüss. zu Rumph's Herb. Amb. 102.

Rottang Cawa (under *Palmijuncus equestris*) Rumph. Herb. Amb. v, 112, tab. LVII fig. 1 A. B.

DESCRIPTION.—Slender, high scandent, rooting at the lowest nodes. *Leaf-sheaths* not flagelliferous, densely armed with slender straight spines. *Leaves* terminating in a long aculeate cirrus, the pinniferous portion about 75 cm. long; petiole 25 cm. long with spinous margins; leaflets few, alternate, subequidistant, remote, lanceolate, about 30 cm. long, furnished with (5?) spiny-setose nerves. *Female spadix* elongate, slender, spathes cylindraceous, aculeate; partial inflorescences few (3–4), bearing few partial inflorescences which are about 4 cm. long. *Fruit* pisiform, mucronate.

HABITAT.—The Moluccas, at Buru and Amboina. In Buru it receives the name of "Codat," in Amboina that of "Ua Cawa," at Bonoa and Loha that of "Rotang Cawa." Very much employed for ligature and reduced into strips for baskets and other wicker-work.

OBSERVATIONS.—Though generally considered a very doubtful species, it seems to me more certain than *C. equestris*, being represented in a fruiting condition in plate LVII fig. 1 (vol. v) of Rumphius. That this plate really belongs to *C. Cawa* I have little or no doubt from what is said in the explanation of the above-mentioned plate at p. 114 and on account of the exactness with which that plate agrees with the description.

C. Cawa is very closely allied to *C. equestris* from which it differs in the more slender rooting stem, in the leaf-sheaths densely spinose, in the slender spadices and chiefly in the not grouped leaflets. In this respect, as in most characters, *C. Cawa* is extremely akin to *C. minahassæ*.

126. **CALAMUS EQUESTRIS** Willd. Sp. Pl. ii, 204; Lam. Encycl., vi, 306; Rees, Cyclop. n. 11; Roem. et Schult. Syst. vii, 1300 (partly—see Mart. Hist. Nat. Palm. iii, 340, No. 532 note); Kunth, Enum. Plant. ii, 204 (partly); Blume, Rumphia, iii, 61; Martius Hist. Nat. Palm. iii, 340 (not 203, 1st edit. and 207, 2nd edit. and excl. t. 113—128). Walp. Ann. iii, 490 and v, 832; Miq. Fl. Ind. Bat. iii, 133 and De Palmis 28; H. Wendl. in Kerch. Palm., 236; Hassk. in Tijdschr. Nat. Geshied. ix, 172 (according to Miq. Fl. Ind. Bat. l. c.) and Neuer Schlüssel zu Rumph's Herb. Amb. 101 (excl. many syn.).

C. Rotang ε Linn. Sp. Plant. 463.

Palmijuncus equestris Rumph. Herb. Amb. 110, 56 (sterilis!).

DESCRIPTION.—Scandent, rather slender, not rooting at the lowest nodes. *Leaf-sheaths* not flagelliferous, rugose, not densely spinulous. *Leaves* about 1 m. long in the pinniferous portion, and terminating in an equally long clawed cirrus; leaflets elliptic-lanceolate, acute, few, inequidistant, resembling those of *C. javensis*, subaggregate, 18–25 cm. long, 3·5–4·5 cm. broad, furnished with many (5?) spinulous-setose nerves; rachis prickly beneath. *Spadix* (♀?) about 1 m. long; lowest primary spathe flattened and acutely two-edged, the edges prickly, upper primary spathes cylindraceous, densely prickly; partial inflorescences few (4–5), about 20 cm. apart each bearing 12–15 arched deflexed spikelets. *Fruit* globose, small, pisiform, shortly beaked, scales straw-coloured.

HABITAT.—The Moluccas, where according to Rumphius it grows on the mountains of Hitu and Hulamul in Amboina, also in the Island of Buru. Native name "Rotang Tsjavoni" or simply "Tsjavoni," and more specially "Utta laun cana."

OBSERVATIONS.—Blume and Martius have established that the name of *C. equestris* must be applied to that species which Rumphius has described at Chap. lviii and figured in Plate lvi of vol. v. The other species of *Calamus* that Rumphius describes in the same Chapter lviii, 112, and which is more specially called *R. Cawa*, is the

C. Cawa Bl., which name must be doubtless applied to the plate lvii fig. 1. A. B. of Rumphius's work, though any reference in the text is wanting.

The name of *C. equestris* has been also improperly applied by Willdenow to the *Calamus* that afterwards Blume distinguished with the name of *C. javensis.* The name of *equestris* has been made use of by Martius for *C. javensis* in plates 113 and 128 of his great work, and partly in the description of *C. equestris* in the text (207 second edit.).

In the chapter treating of the *Palmijuncus equestris*, Rumphius mentions also another *Calamus* similar to *R. Tsjavoni*, but much more robust, which is said to be common in Circkzee, a small island near Batavia. To this *Calamus* Blume (Rumphia iii, 31) assigned the name of *C. maritimus*, but this is not recognizable, and certainly it has already been published under another name.

127. CALAMUS CUTHBERTSONII Becc. in Nuovo Giorn. Bot. It. xx, (1888), 179, and in Rec. Bot. Surv. Ind. ii, 202.

DESCRIPTION.—Slender and probably scandent. *Leaf-sheaths* . . . . . *Leaves* small, about 25 cm. long, not cirriferous; petiole very slender, flattish above with obtuse sides, where armed with a few straight spines, roundish beneath; rachis trigonous, furfuraceous and like the petiole irregularly armed beneath with scattered claws; leaflets very inequidistant, very few, 9 in all, of which four are approximate at the summit and the side ones scattered, alternate or subopposite, 10–13 cm. long, 10–13 mm. broad, narrowly lanceolate, rather suddenly narrowed to the base and from their lower third or fourth part upward gradually long-acuminate into a subulate apex, which is bristly at the sides; the 4 uppermost shorter and less acuminate than the side ones and the two of the terminal pair connate up to about the middle; all are thinly papyraceous, rather rigid, dull and glabrous on the upper surface, slightly paler and fugaciously rusty-furfuraceous mainly near the base beneath, with the mid-costa rather acute in the upper surface, where it is accompanied on each side by a slender, often indistinct, secondary nerve, and is occasionally but not always furnished with a few spinules; beneath, the mid-costa is indistinct and smooth; margins remotely spinulous, the lower one in the upper surface bordered with a shining band; transverse veinlets few, remote, much interrupted. *Male spadix* . . . . . *Female spadix* short (not seen entire) rigid, erect, more or less furfuraceous throughout; primary spathes narrowly tubular at the base, slightly enlarged and loosely sheathing in their upper part, exsuccous, papyraceous, prolonged at the summit into a triangular point and sprinkled with a few very small tubercled claws; the lowermost spathe slightly flattened, spinulous at the sides; partial inflorescences few, small, erect, pyramidate, 6–7 cm. long with 3–4 distichous slightly arched spikelets on each side; secondary spathes tubular-infundibuliform, unarmed, ciliate and truncate at the mouth and produced at one side into a narrow and subulate point; the largest spikelets, the lowest, 18–20 mm. long, with 6–8 flowers in all, the upper suddenly shorter and with very few flowers. *Female flowers* biseriate, rather remote, not flatly bifarious, all pointing upwards; spathels tubular-infundibuliform, truncate at the mouth; involucrophorum subdiscoid, shortly pedicellate; involucre flat, discoid, entire, irregularly orbicular; areola of the neuter flower tuberculiform. *Fruiting perianth* pedicelliform; the calyx cylindraceous, smooth and callous at the base, divided down to the middle into 3 broad semiovate rather obtuse lobes; the segments of the corolla slightly longer than the calyx, lanceolate, acute, striately veined outside; the filaments of the stamens forming an urceolate cup, which is crowned by 6 elongate triangular teeth. *Fruit* broadly ovate-elliptic, about 12 mm. long and 8 mm. broad, suddenly contracted at the apex into a small acute beak; scales in 18 series, reddish-brown with a darker (almost blood-red) shining marginal line, rather convex, faintly channelled along the middle; margins erosely toothed. *Seed* with equable albumen.

HABITAT.—British New Guinea on Mt. Obree at about 2,500 m. elevation. Discovered by Mr. W. A. Sayer in the summer of 1887. The specimens were sent to me by the Baron Ferd. von Mueller.

OBSERVATIONS.—The description of this species is derived from a specimen consisting of only two leaves and one spadix with immature fruit. The spadix is 20 cm. long with two partial inflorescences, and the terminal portion is wanting. The two leaves are without the basal portion of the petiole; one is 20 cm. and the other 23 cm. in length. The affinities of this species are somewhat uncertain. In the short not cirriferous leaves with few leaflets (of which 4 approximate at the summit) it approaches the species of the group of *C. javanicus*, but in spadix it has a general resemblance to the species of Group XII (*C. heteracanthus*, *adspersus*, *etc.*) mainly on account of the secund arrangement of the flowers and of the subpedicellate involucrophorum. The characteristic marks are: the short not cirriferous leaves with very few equidistant unicostate lanceolate leaflets of which 4 are approximate at the summit, the rigid short spadix, the spikelets with secund flowers, the discoid shortly pedicellate involucrophorum.

PLATE 148.—Calamus Cuthbertsonii *Becc.* The entire specimen described above.

128. CALAMUS SPATHULATUS Becc. in Hook. f. Fl. Brit. Ind. vi, 459 and in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—Slender, apparently scandent, at first sight glabrous, but in fact covered throughout, except on the leaflets, flowers and fruit with very small rusty scales which are scattered on the sheaths, rachis and primary spathes, and denser on the secondary spathes and spathels. *Sheathed stem* 10–12 mm. in diam. *Leaf-sheaths* flagelliferous, pale-yellowish (as are the other parts of the plant when dry), very thickly coriaceous, gibbous above, densely armed with short, 3–8 mm. long, solitary, scattered or sometimes slightly confluent spines, which are swollen or bulbous and light-coloured at the base and with an ascendent narrowly triangular, underneath flat, black tip. *Leaf-sheath flagella* very long, flattened and acutely two-edged in the basal part, densely aculeolate upwards. *Leaves* short, in one specimen (Lobb's) 50 cm. long, including a slender filiform aculeate terminal cirrus; another specimen (Hervey's) has a leaf subcirriferous and bears at the summit at different levels 2 unequal leaflets the uppermost of which is laterally aculeate on the rachis side; petiole very short, flat above; rachis obsoletely bifaced above, armed beneath with rather strong broad and light-based black-tipped claws, which are solitary at first and 2–3-nate upwards but gradually become smaller and weaker towards the summit; leaflets very few (5 in Lobb's specimen) inequidistant, remote alternate or opposite, never fascicled, spathulate or oblong-obovate, strongly concavo-convex or spoon-shaped at the summit, about 20 cm. long, 6–7 cm. broad (the lower ones smaller), tapering and acute towards the base; very suddenly contracted at the summit into a short obtuse bristly penicillate tip, the bristles ultimately deciduous, firm, thinly coriaceous or subpergamentaceous, shining and green on both surfaces, slightly paler beneath, with 3–5 primary sub-equal nerves or costulae and a few secondary ones, all naked on both surfaces, but feebler beneath; transverse veinlets very sharp and distinct on both surfaces, excessively numerous, very approximate and continuous across the blade; margins quite smooth and thickened by a rather strong nerve. *Male spadix* . . . . . *Female spadix* elongate, flagelliform, simply decompound, in one specimen about 1 m. in length, including a slender apical, 10 cm. long, aculeolate tail-like appendix; upper primary spathes tubular-cylindraceous, elongate, closely sheathing, coriaceous, densely aculeolate throughout, obliquely truncate and entire at the mouth, slightly prolonged at one side into a short rather obtuse triangular point, gradually passing at the base into the axial part, this flat on the inner side, convex and sparsely aculeate externally; lowest primary spathe flat on the inner side, convex and sparsely aculeate externally, the margins acute; partial inflorescences few, rather distant erecto-patent, inserted at or above the mouth of their respective spathes with a distinct axillary callus and a deep transverse rima; the lower ones, the largest 15–30 cm. long, with 6–13 spikelets on each side; secondary spathes tubular-infundibuliform, entire and truncate at the mouth, apiculate at one side, aculeolate or almost smooth; spikelets distichous, horizontal, inserted just at the mouth of their own spathe with an axillary callus, rather slender, rigid, slightly arched, 2·5–6 cm. long, with 8–15 rather approximate sub-horizontal flowers on each side; the uppermost scarcely shorter than the lower ones; spathels shortly and broadly infundibuliform, truncate and entire at the mouth, slightly apiculate at one side; involucrophorum laterally attached almost outside its own spathel at the base of the one above and distinctly callous at its upper axilla, sessile, shallowly cupular; involucre regularly cupular, barely exceeding the involucrophorum, the margin slightly undulate; areola of the neuter flower large, conspicuous, lunate, sharply bordered, callous and umbilicate in the centre. *Female flowers* small, ovoid, acute in bud. *Neuter flowers* very similar to the fertile ones and almost as large. *Fruiting perianth* shortly but distinctly pedicelliform, the calyx indurated and slightly ventricose at the base, divided midway down into 3 irregularly split lobes; the corolla almost twice as long as the calyx, its segments ovate-lanceolate acute, polished outside; staminal urceolum crowned by 6 broadly triangular subulate teeth. *Fruit* (when nearly ripe) regularly ovoid-elliptic, equally rounded at both ends, caudiculate at its base, topped by a slender, 3 mm. long, exactly cylindricous beak, which is crowned by the small recurved stigmas, 12 mm. long including the beak and the perianth, and 7 mm. broad; scales in 18 series, almost as long as broad, narrowly channelled along the middle, very light-coloured, subshining, with a lighter scarious margin and an obtuse and often reddish-brown tip. *Seed* oblong, above 8 mm. long, coarsely pitted on the back; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula: collected at Malacca by Th. Lobb (Herb. Kew.) and found again in the same locality more recently by Mr. F. A. Hervey.

OBSERVATIONS.—Lobb's specimen consists of a portion of the sheathed stem with an entire leaf and of a female spadix with immature fruit; the largest partial inflorescence is 13 cm. long with 11 spikelets in all. Hervey's specimen has a more robust female spadix than the preceding, its largest inflorescence being 30 cm. long with 13 spikelets on each side. This specimen forms the passage to the var. *robustus*. *C. spathulatus* is distinguishable by the light yellowish colour of all its parts when dry, by the subcirriferous shortly petiolate leaves with few firm spathulate cochleate many-costulate closely and sharply transversely veined leaflets, and the ellipsoid small fruit topped by a long narrow cylindricous tip.

From *C. Martianus* it differs in its larger size, in the leaves with longer petioles, larger and more obtuse leaflets.

PLATE 149.—Calamus spathulatus *Becc.* The summit of a leaf (upper surface); portion of the female spadix in flower; partial inflorescence with mature fruit.—From Hervey's specimen in Herb. Kew.

CALAMUS SPATHULATUS var. ROBUSTUS Becc. in Hook. f. Fl. Brit. Ind. vi, 459, and in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—Scandent, of moderate size, 6–10 m. long. *Sheathed stem* 20–22 mm. in diam. *Leaf-sheaths* armed as in the type but with more robust, even 10–15 mm. long spines. *Leaf-sheath flagella* very long (2 m.), strongly flattened at the base, armed lower down with solitary and upwards with 2-3-nate or half-whorled claws. *Leaves* 1–1·3 m. in length, subcirriferous; leaflets about 5 on each side, some of them up to 40 cm. long, usually 25–30 cm., a few at the apex smaller, the uppermost semi-abortive, laterally aculeolate on the side of the prolongation of the rachis. *Male spadix* . . . . . *Female spadix* robust (not seen entire); its main axis almost 1 cm. in diam.; partial inflorescences robust, about 30 cm. long, with 10 spikelets on each side; secondary spathes rather short, tubular-infundibuliform, almost glabrous or fugaciously scaly-furfuraceous, unarmed or sparingly spinulous, horizontally truncate at the mouth, sometimes longitudinally split; spikelets 6–8 cm. long with 12–18 flowers on each side. *Female flowers* about 4 mm. long. *Fruit* (nearly mature) ovoid-elliptic, about 15 mm. long, including the cylindric beak which is 3 mm. long; scales in 18 series, pale-yellowish, with faintly rusty-brown margins. *Seed* oblong, rounded at both ends, deeply pitted on the back; chalazal fovea elongate, shallow on the flattish raphal side; albumen equable; embryo basal.

HABITAT.—The dense forests of the Malayan Peninsula at the foot of Gunong Malacca (Sir G. King's collector No. 7136 in Herb. Calc.).

OBSERVATIONS.—The leaves of this variety differ only in their larger size from those of the type-specimens; the spadices, however, are considerably more robust, their main axis attaining 1 cm. in diam. The leaves in the type as in the variety vary a good deal as to their termination; some of them being distinctly, though shortly, cirriferous, while others terminate in diminutive leaflets which are aculeolate on the side of the prolongation of the rachis.

PLATE 150.—CALAMUS SPATHULATUS var. ROBUSTUS *Becc.* Portion of a sheathed stem with base of a leaf and a flagellum; the summit of a leaf; portion of partial inflorescence with almost mature fruit.—From No. 7136 in Herb. Calc.

129. CALAMUS MARTIANUS Becc. in Hook. f. Fl. Brit. India, ii, 459, and in Rec. Bot. Surv. Ind. ii, 214.

C. penicillatus (not of Roxb.) Mart. Hist. Nat. Palm. iii, 334.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* 6 mm. in diam. *Leaf-sheaths* light yellowish like the other parts of the plant when dry, flagelliferous, gibbous above, sprinkled with small rusty scales, armed with very small short ascendent black-tipped prickles which rest on a broad and tumescent base and are flat underneath. *Ocrea* short, thinly coriaceous, obliquely truncate, naked. *Leaf-sheath flagella* slender, callous at their insertion, armed from the base with at first scattered and upwards half-whorled claws. *Leaves* impari- or sub-imparipinnate, or subcirriferous and terminating in a rudimentary leaflet, small, 35–40 cm. long, epetiolate; rachis more or less obsoletely trigonous, rather densely and irregularly armed thoughout to the base of the terminal leaflet with rather robust black-tipped solitary or even geminate and ternate claws; leaflets very few, about 10 in all, remote, very inequidistant, but not with a tendency to be approximate in groups, narrowly elliptic-lanceolate or oblanceolate, gradually tapering lower down towards a very acute base, usually broader above the middle, and thence rather suddenly narrowed to a subulate tip, which terminates in a small brush of a few black bristles, firmly but thinly papyraceous; opaque and yellowish-green on both surfaces (when dry), sub-5-costulate; the mid-costa slender acute, the side costae still more slender and often indistinguishable from other secondary nerves, two of which almost marginant, all naked on both surfaces; transverse veinlets very sharp and distinct on both surfaces, very close together and continuous across the blade; margins quite smooth; the largest leaflets, the intermediate, 14–15 cm. long, 18–20 mm. broad; the two of the lowermost pair horizontal, smaller, inserted just at the mouth of the sheath, the upper ones somewhat smaller, the one at the summit the smallest; often the leaf terminates in two unequal leaflets, the one decurrent on the other. *Male spadix* very slender; longer than its leaf, with 3–4 remote partial inflorescences and terminating in a filiform aculeolate flagellum; primary spathes tubular, very narrow, very closely sheathing, rather densely and sparsely clawed, obliquely truncate and naked at the mouth where prolonged at one side into a short triangular point, their base gradually passing into a slender elongate, externally clawed, axial part; partial inflorescences lax, elongate, inserted with a conspicuous axillary callus above the mouth of their respective spathes; the largest, the lowest, 15 cm. long, with 4–5 spikelets on each side; secondary spathes smooth, excessively narrow, very closely sheathing, slightly enlarged above, or subclavate, truncate and apiculate at one side at the mouth; spikelets horizontally inserted outside the mouth of their own spathe with a distinct axillary callus, their axis very slender, slightly sinuous between the flowers;

the lower ones, the largest, 3–3·5 cm. long, with 5–6 very remote horizontal flowers on each side, the upper with 3 or 4 only; spathels tubular-infundibuliform, narrowed a good deal to the base, truncate, naked and entire at the mouth, apiculate at one side, strongly striately veined; involucre laterally adnate outside its own spathel to the base of the one above, cupular, with narrow entire externally strongly veined limb.—Other parts unknown.

HABITAT.—Pulo Pinang, where it was discovered by Gaudichaud in 1839. No. 37 in Herb. Delessert at Geneva and in Herb. Webb at Florence.

OBSERVATIONS.—Gaudichaud's specimens mentioned above were referred by Martius to *C. penicillatus* Roxb.; but this is a very doubtful species which apparently must be reduced to *C. javensis.* Furthermore, the *Calamus* that Martius describes under the name of *C. penicillatus* at p. 334 is not the same as that of which he gives the description at p. 210 of the first edition of this page; this last description being derived from that of Roxburgh, while that at p. 334 was based on the already-mentioned specimens collected by Gaudichaud at Penang. *C. Martianus* is very closely related to *C. spathulatus*, of which perhaps it represents a depauperate or a more slender form, but in the absence of the female spadix and fruit in *C. Martianus* and of the male spadix in *C. spathulatus*, it is impossible to make an exact comparison of the two,—*C. Martianus*, like *C. spathulatus* and *C. insignis*, acquires a yellowish tint in drying and keeps this colour in Herbarium specimens; certainly they appear very nearly allied species if they are not different forms of one only. *C. Martianus* differs from *C. spathulatus* in its smaller dimensions and in the smaller and more acuminate leaflets and in the petiole being almost obsolete.

PLATE 151.—Calamus Martianus *Becc.* The summit of the plant with a male spadix stripped of its flowers.—From the type-specimen in Herb. Webb at Florence.

130. **CALAMUS INSIGNIS** Griff. in Calc. Journ. Nat. Hist. v, 59, and Palms Brit. Ind. 69; Mart. Hist. Nat. Palm. iii, 338; Walp. Ann. iii, 488 and v, 831; Miq. Fl. Ind. Bat. iii, 128; Hook. f. Fl. Brit. Ind., vi, 459; Becc. in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—Slender, probably scandent. *Sheathed stem* 8–18 mm. in diam.; naked canes terete, smooth (not striate) straw-coloured, polished, the internodes 5–8 cm. long. *Leaf-sheaths* sometimes flagelliferous, gibbous above, obliquely truncate and entire at the mouth, dotted—as the petiole and leaf-rachis—with very minute small scales, more or less armed with short (1–8 mm. long) semi-conic broad-based horizontal or slightly deflexed black-tipped prickles. *Ocrea* very short, naked. *Leaves* not cirriferous, 40 cm.–1 m. long; petiole 10–25 cm. long, subterete from the base, armed all round with solitary small, or in the lower surface sometimes rather strong claws; rachis similarly armed beneath, acutely bifaced and smooth above; leaflets very few, 3–6 on each side, besides the two of the terminal pair, which are about midway up connate by their bases, but otherwise not differing in size and shape from the side ones; the latter alternate, ovate- or obovate-oblong, cuneately alternate and acute at the base; concavo-convex or spoon-shaped, especially near the summit where rounded and very suddenly contracted into a short triangular bristly-penicillate tip, firmly papyraceous or subpergamentaceous, very glabrous, hairless or spineless and shining on both surfaces, with the mid-costa slender and acute above and 6–8 very slender but sharp secondary nerves on each side of it and a strong primary nerve considerably thickening both margins; the margins themselves quite smooth; transverse veinlets very sharp and distinct on both surfaces, excessively numerous, very approximate and continuous across the blade; the largest leaflets are the intermediate ones, and these vary from 8–12 cm. in length and 3–4 cm. in width in small specimens, and from 20–27 by 5–8 cm. in the larger ones; those near the base are considerably and the two of the terminal pair only slightly smaller.—Spadices unknown.

Habitat.—The Malayan Peninsula near Malacca, where it was first discovered by Griffith's collector F. Fernandes (Herb. Kew.), and recently found again near Perak by the Revd. Father Scortechini; always sterile (Herb. Beccari).

Observations.—Griffith's specimen in the Herbarium at Kew consists of two entire leaves with their leaf-sheaths, these 8–9 mm. in diam., and with only 7 leaflets (8–12 cm. long) including the two, highly connate, of the terminal pair; the sheaths armed with small tubercular prickles. Scortechini's specimens are a good deal larger, and the leaf-sheaths are more strongly armed, and one of these bears the base of a flagellum. It seems, however, that both specimens are from young and not yet fertile plants; as they stand they differ from the specimens of the adult *C. spathulatus* in the leaf-sheaths being armed with horizontal or slightly deflexed spines (not ascendent), in the leaves with longer subterete petioles, and in the unicostate less elongate leaflets. The doubt remains whether these differences depend on the age of the plant.

Plate 152.—Calamus insignis *Griff.* Portion of a sheathed stem with an entire leaf.—From Scortechini's specimen in Herb. Becc.

131. Calamus ornatus Bl. in Roem. et Schult. Syst. Veg. vii, 2, 1326; Mart. Hist. Nat. Palm. iii, 203 (1st edit.) and 208 (2nd edit.) and 332 and t. 116. fig. ii; Kunth Enum. Pl. iii, 205; Blume, Rumphia iii, 58 and t. 148 (excl. figs. 8–12 representing the fruit of *Daemonorops ruber* Reinw.); Walp. Ann. iii, 483 and v. 830; Miq. Fl. Ind. Bat. iii, 113 and De Palmis, 27.

C. aureus Reinw. in Mart. Hist. Nat. Palm. iii, 208 (1st edit.) and 341; Kunth Enum. Pl. iii, 207; Walp. Ann. iii, 491, and v. 832; Miq. Fl. Ind. Bat. iii, 136 and De Palmis 29.

C. ovatus Reinw. in Mart. l. c. 208.

Description.—Very high scandent and very robust. *Sheathed stem* 4–7 cm. in diam. *Leaf-sheaths* very thick and woody, gibbous above, fugaciously furfuraceous, lightcoloured when dry, more or less armed with large flat very broad solitary or seriate spines or even almost smooth. *Leaf-sheath flagella* up to 10 m. long; very strong, somewhat flattened and two-edged in their basal part, terete upwards and powerfully armed with robust black-tipped half-whorled claws, very slender and filiform at the extremity. *Ocrea* very short. *Leaves* of the upper part of the stem of the adult and fertile plant very large, up to 4 m. long, sub-cirriferous, viz., with the summit of their rachis strongly clawed and furnished with alternate diminutive leaflets; petiole long and robust (up to 60–70 cm. in length and 2·5–3 cm. broad at the base) rounded beneath, channelled above near the base, flat upwards, more or less irregularly armed with broad straight spines; rachis in the intermediate portion acutely bifaced above, slightly convex or flattish beneath where somewhat irregularly armed along the middle and at the sides with large brown-tipped solitary or binate claws, these becoming more numerous and ternate towards the sub-cirriform summit; eaflets numerous, rather remotely alternate, equidistant, firmly papyraceous, very large, elongate-lanceolate, acuminate and setose at the apex, plicate, 5-costate, green and sparingly bristly spinulous on 1–3 or even on all the 5 costae above, naked and paler or subglaucescent beneath; transverse veinlets not very conspicuous, but extremely numerous and approximate; margins remotely bristly; the largest leaflets, the intermediate ones, 50–60 and even 80 cm. long, 5–9 cm. broad, the upper ones gradually smaller, those at side of the cirriform termination small. *Radical leaves* with excessively long and terete petioles and sparingly aculeolate rachis, terminated by a large bipartite leaflet, or two highly connate leaflets. *Male spadix* very large with a very long and robust flagellum at its summit, ultradecompound, with many branched panicled partial inflorescences; primary spathes very long, tubular, closely sheathing, armed with seriate prickles; secondary spathes short, tubular-infundibuliform, rather loosely sheathing in their upper part, smooth, fugaciously furfuraceous, obliquely truncate and densely ciliate at the mouth; tertiary spathes shorter, more enlarged above and more attenuate at the base than the secondary ones, asymmetrically infundibular-cyathiform, unarmed, truncate and ciliate at the mouth, 10–15 mm. long, acute at one side; spikelets inserted at the mouth of their own spathe, 5–8 cm. long, somewhat flattened, bearin on each side 13–17 distichous approximate erecto-patent fiatly bifarious flowers; the spikelets of the upper part of the inflorescences larger and longer than those of the side branchlets; spathels concave, broadly bracteiform, ciliate, horizontal or almost deflexed, prolonged at one side into a broad point and each subtending its own flower; involucre attached at the base of the spathel above its own and much shorter than this, cupular, truncate, deeply emarginate and acutely bidentate on the side next to the axis. *Male flowers* oblong-ovoid; the calyx obsoletely striately veined, divided down about to the middle into 3 broad triangular acute lobes; the corolla one-third longer than the calyx, its segments ovate-lanceolate acute, opaque outside. *Female spadix* simply decompound with a very robust axial part, very large, elongate, flagelliform, up to 1·5–2 m. in length, not including a very robust strongly clawed flagellum about as long or longer, with very few (3–4) very remote partial inflorescences; primary spathes very elongate, tubular, closely sheathing, coriaceous, truncate at the mouth, slightly prolonged at one side into a short and broad point, more or less armed with short triangular flat deflexed confluent and seriate spines, the lowest shorter than the others, 2–4 cm. thick, somewhat flattened and two-keeled, the upper ones a good deal longer and cylindraceous, slightly and gradually narrowed to the base; partial inflorescences inserted at the mouth of their own spathe, ascendent and adpressed to the axis at the base, speedily arched and recurved, the lower ones, the largest, up to 60 cm. long and with 15–16 spikelets on each side; secondary spathes tubular, slightly infundibuliform, short, 10–15 mm. long, closely sheathing, truncate and entire at the mouth; slightly apiculate at one side; spikelets very robust, 10–18 cm. long with 10–20 flowers on each side; the upper ones shorter, thick and rigid, inserted at the mouth of their respective spathe, horizontal or more or less recurved, and slightly arched; spathels very shortly and broadly infundibuliform, narrow at the base, truncate, entire, slightly apiculate at one side; involucrophorum inserted inside its own spathe at the base of the one above, cupular, posticously two-keeled; involucre exsert from the involucrophorum, somewhat unilaterally cupular, rather deep, shining inside, entire; areola of the neuter flower large, ovate, very sharply bordered. *Female flowers* flatly bifarious, about 5 mm. long. *Fruiting perianth* distinctly pedicelliform, the calyx polished in the part included in the involucre, with 3 broad triangular lobes; the segments of the corolla a good deal narrower and as long as the lobes of the calyx. *Fruit* large, ellipsoid sub-obovate, very suddenly and shortly conically beaked, 3–3·5 cm. long; scales in 15 series, deeply channelled along the middle, with a short rather obtuse point and an erosely toothed margin. *Seed* when freed from the once fleshy integument with a very irregular and uneven surface; albumen equable; embryo basal.

HABITAT.—Of this very variable species ranging from Java, Borneo, Sumatra, the Malayan Peninsula, and the Philippines, the following geographical varieties may be distinguished.

CALAMUS ORNATUS var. JAVANICUS (Bl.) Becc.

DESCRIPTION.—*Leaf-sheaths* almost unarmed. *Leaves* of the upper part of the plant with distinctly 5-costate leaflets; 3 costae spinulous above. *Fruit* scales spadiceous.

HABITAT.—Java; occurring on the limestone hills more frequently than elsewhere. It has been found also in Bantam on the hills of Seribu, on the mount near Tjampia and in the forest of the lower part of mount Salak (Bl.).

It is one of the largest known species. Its Rotang, which is very long and robust, is often employed as a cable stretched across rivers for moving ferry boats. The seed, enveloped by an acid grateful and refreshing pulp, is eaten by the Javaneese, which, along with the roots bruised in water, make a potion used to alleviate the pains of labour (Bl.).

C. ornatus receives in Java the name of "Huy Suttie," "Seutti" or "Setì" and in the Western provinces especially that of "Huy Kassuri."

Some sterile specimens collected in Java by Hasskarl and preserved in the Leyden Herbarium bear the name of "Huy karuk-rok."

OBSERVATIONS.—I have seen of this, otherwise easily recognisable species, a portion of a male spadix and of a radical leaf of Blume's authentic specimen. My knowledge of the fruit of the Javan form is derived only from the figure of Martius, and the descriptions of Blume, as I have seen no specimen of it. The radical leaves of *C. ornatus* differ from those of the upper part of the stem in the longer subterete petiole, which is armed with long and slender spines, and in the rachis less powerfully furnished on the back with rare, solitary, straight, more or less deflexed spines terminating in a flabelliform more or less deeply partite leaflet.

Seemingly the more the leaves belong to the higher part of the adult plant the more they have a tendency to become cirriferous; it seems also that the 5 costae are more prominent in the leaflets of the radical leaves than in the upper ones.

The armature of the leaf-sheaths is probably very variable according to the age of the plant and in the Javan form the sheaths appear generally very sparingly armed or even quite smooth.

I consider *C. aureus* Reinw. the same as *C. ornatus*. The authentic specimen of *C. aureus* which I have seen, is preserved in the Herbarium at Munich, and consists in a portion of the naked stem and an entire leaf, which is a radical one with a subterete petiole, 1·5 cm. in diam. at the base, and 1·20 m. long, armed with scattered straight spines. The rachis is feebly aculeate, and at the extremity is unarmed; the leaflets are exactly like those described by Martius, and in no way differ from those of the authentic specimens of *C. ornatus;* the two apical leaflets are not very large, and are shortly united at their bases; all are naked beneath and sparingly spinulous on the 5 robust costae of the upper surface.

The home of *Calamus aureus* is said to be Celebes, but very likely that locality is erroneous, as I have had occasion to state with respect to other species of *Calamus* collected by Reinwardt; and indeed in the Munich Herbarium the authentic specimen of *C. aureus* is labelled from Java and the handwriting is not that of Martius.

CALAMUS ORNATUS var. HORRIDUS Becc. in Hook. fil. Fl. Brit. Ind. vi, 460 and in Rec. Bot. Surv. Ind., ii, 215.

C. ornatus Bl. Griff. in Calc. Journ. Nat. Hist. v. 37 and Palms Brit. Ind. 46.

DESCRIPTION.—*Leaf-sheaths* glabrescent, powerfully armed with broad laminar lanceolate spines, 2–3 cm. long, confluent by their bases and disposed in transversal rows, these 3–5 cm. apart. Radical *leaves* with leaflets furnished with 5 distinct spinulous costae; the leaflets of the upper leaves less spinulous and less distinctly 5- or at least 3- costate.

HABITAT.—The Malayan Peninsula. Griffith's specimens were collected by E. Fernandez near Malacca at Durian Tungul. Father Scortechini gathered the same Palm in the district of Perak (No. 587^b) and Sir G. King's collector on the hills of Larut also in Perak at an elevation of between 50–150 metres (H. H. Calc. No. 3931). The Malay name in Perak is Rotang Mantang (Scortechini); "R. Ruga Bodak" (Griffith).

OBSERVATIONS.—Of Griffith's specimen of *C. ornatus* I have seen only an intermediate portion of a leaf with 2 leaflets in the Kew Herbarium and another similar portion in that of Calcutta, nevertheless these specimens have been sufficient to establish their perfect identity with the more complete ones collected by Scortechini and by Sir G. King's collector.

In Griffith's specimens the leaf-rachis is 13 mm. thick, triangular in section, and bifaced above with an acute and naked angle, slightly convex below and armed along the middle and at the sides with robust, solitary or subconfluent claws; the leaflets are 60 cm. long by 6·5 cm., light coloured (when dry), paler or subglaucescent beneath, elongate-lanceolate, attenuate and strongly plicate at the base, acuminate at the apex into a short point; the primary nerves are 5, of these 2 are weaker than the others, the mid-costa is rather acute and prominent above and bears short spinules near its summit; below all the nerves are very faint and naked; transverse veinlets very crowded, delicate; margins distinctly spinulous.

The Larut specimen (No. 3951) agrees pretty well with those of Griffith as to the leaflets of the adult leaves, and both differ from those of Java only in being less spinulose on the upper surface which appears 3-costate instead of 5-costate, two of the primary nerves being weaker than the others and nearly of the same strength as the secondary ones. A terminal portion of a radical leaf has the apical leaflet flabelliform deeply partite, each lobe being furnished with 7 spinulous costae above, naked beneath. Scortechini's No. 587^{b}, according to a note by the collector, is a very high scandent and very robust plant, creeping on the ground in the lower portion with internodes 45–60 cm. long and furnished with a tuft of radical leaves rather larger than the cauline ones 2–3 metres long, their petiole 0·6–1 m. long; the leaflets 5–10 cm. apart (Scortechini). The specimen mentioned has the sheathed stem 6 cm., and the naked canes 2·5–3·5 cm. in diam., the leaf-sheaths are armed with broad, laminar, lanceolate spines, 2–3 cm. long, confluent and arranged in series, these 3–5 cm. apart. Some of its leaflets are distinctly 5-costate, all the costae being spinulose; others, those of the adult leaves, are 3-costate. It seems that the leaflets of the radical leaves have 5 spinulose costae and that those of the upper portion of the stem are only 3-costate and less spinulous.

CALAMUS ORNATUS var. SUMATRANUS Becc. in Rec. Bot. Surv. Ind. ii, 215.

C. ornatus Bl. Miq. Palm. Sum. in Journ. de Bot. Néerl. i, 21, and Prodr. Fl. Sum. 256.

DESCRIPTION.—*Leaf-sheaths* furfuraceous, powerfully armed with broad lanceolate, not confluent, but closely and obliquely seriate spines. *Leaflets* in the upper cauline leaves 3- and sub-5-costate; 3 costae only spinulous above. *Fruit* with almost black scales when dry.

HABITAT.—Sumatra. Prov. of Padang in the very dense and damp forest near the stream at Ayer Manchor, *Beccari* P. S. No. 833.

OBSERVATIONS.—Very large. *Leaf-sheaths* sparsely furfuraceous, 6 cm. in diam., extraordinarly armed with numerous non-confluent robust laminar lanceolate spines which have their base 10–15 mm. broad swollen above, 2–3·5 cm. long and arranged in oblique interrupted and very approximate rows. *Leaves* of the upper part of the stem subcirriferous; their rachis armed, mainly towards the summit, with 3-nate robust, black-tipped claws; leaflets pale beneath, sub-5-costate with the mid-costa acute and spinulous, mainly towards the point, a lateral nerve on each side is also sparingly spinulous above, the other nerves are more slender and naked; the largest leaflets 60 cm. long, 6 cm. broad; those of the subcirriform summit 8–10 cm. long, 1 cm. broad. *Fruit* ovoid-elliptic suddenly contracted into a conic beak, crowned by the remains of the not very distinct stigmas, rounded at the base, but furnished there with a small apiculum which penetrates into the pedicelliform perianth. The dry fruits vary from 3–3·5 cm. in length and 20–22 mm. in breadth; those preserved in alcohol measure even 4 cm. (including the beak and the basal apiculum) and 23–25 mm. in breadth; scales rather opaque, rhomboid, in 15 rows, when fresh dark spadiceous, with darker not very distinct intramarginal line; when dry almost black, channelled along the middle, rather obtuse or slightly prolonged into a point; margins erosely toothed. *Seed*, when fresh, enveloped by an abundant pulp, 22 by 14 mm., when dry and freed from the integument 15–18 mm. long and 12–13 mm. broad, very irregular, suborbicular or oblong in outline, with a very uneven surface; flattish on the back, rather convex and boldly tubercled on the raphal side with a narrow and deep chalazal fovea there; albumen equable; embryo basal.

PLATE 153.—CALAMUS ORNATUS var. SUMATRANUS *Becc.* Portion of a leaf-sheath with the base of its leaf; the petiole with the base of the pinniferous portion (under surface); partial inflorescence with portion of the axis of the spadix sheathed with a primary spathe and mature fruit; seed, dorsal and raphal side and longitudinally cut through the embryo.

CALAMUS ORNATUS var. PHILIPPINENSIS Becc. *C. maximus* Blanco, Flora de Filipinas, 1st edit. 1837, 265 and Gran edicion (Andres-Naves) i, 331; Kunth Enum. Plant. iii, 595; Martius, Hist. Nat. Palm. iii, 343; Walp. Ann. iii, 492, and v, 832; Miq. Fl. Ind. Bat. iii, 138.

DESCRIPTION.—*Fruit* ellipsoid, 3·5 cm. long 23 mm. broad, very suddenly and shortly conically beaked; scales in 15 series, deeply channelled along the middle, reddish brown with a narrow black marginant line. *Seed* oblong very obsoletely and irregularly 4-angular, 18 mm. long, 15 mm. broad, 13 mm. thick, when freed from the crustaceous, once fleshy integument.

HABITAT.—The Philippines in Central Luzon, *Loher* No. 1387 in Herb. Kew.

OBSERVATIONS.—I have seen of this only a portion of a female inflorescence with mature fruit, but I was struck by the form of its seed, which corresponds with Blanco's description "una semilla oblonga con 4 angulos confusos," a form which I have not met with in any other *Calamus.* The fruit is said to be eaten by the natives, and this is a proof of its large size. The other characteristics of *C. maximus* in Blanco's description correspond also fairly well with those of *C. ornatus.* The identification of *C. maximus* with *C. ornatus* Bl. does not, however, alter the nomenclature of this species as the name *ornatus* is more ancient than that given to the same plant by Blanco.

CALAMUS ORNATUS var. MITIS Becc. in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—*Leaf-sheaths* strongly gibbous above, armed on the ventral side mainly near the mouth with a few large broad laminar spines, naked elsewhere. *Leaves* subcirriferous; rachis armed with robust solitary geminate or ternate claws; leaflets gradually decreasing in size towards the summit, those of the cirriform portion of the rachis 3–4 cm. long with a brush of black bristles at the apex; the largest *leaflets* distinctly 5-costate, usually with the mid-costa only spinulous and the side nerves naked or with very few spinules. *Male spadix* as in the type. *Fruits* unknown.

HABITAT.—Borneo; in Sarawak at Penindgiao (*Beccari* P. B. No. 985—Nov. 1895) and at the foot of Mt. Mattang (*Beccari* P. B. No. 1937). In Sarawak it receives the name of "Rotang Samambu." This *Calamus* was also gathered in Borneo by Low, who assigns to it the Malay name of "R. Selyan," but his specimen is not accompanied by any special indication of locality.

OBSERVATIONS.—The specimen No. 985 of the Bornean plants consists of portions of a male spadix in flower and in portions of radical leaves, which do not differ in any way from the corresponding parts of the Javan form.

The specimen No. 1937 consists of a leaf of an adult plant with its leaf-sheath 7 cm. in diameter.

Low's specimen in the Kew Herb. is a less robust plant than those quoted above. The leaf-sheath is flagelliferous and quite unarmed. The summit of a leaf is terminated by two leaflets connate by their bases, one decurrent or inserted higher up than the other.

PLATE 154.—CALAMUS ORNATUS var. MITIS *Becc.* Leaf-sheath with the base of a leaf and of a flagellum leaflet (upper surface) with portion of the rachis; subcirriferous summit of a leaf from the upper part of an adult plant from Becc. P. B. No. 1937. Partial inflorescence of a male spadix, from Becc. P. B. No. 985.

132. CALAMUS SCIPIONUM Lour. Fl. Cochinch. 1st edit. i, 210 and Willd.'s edit. i, 260; Lam. Encycl. vi, 304 exl. Lam. Illustr. and excl. syn. except Lour.; Sprengel Syst. Veg. ii, 17; Roem. et Schult. Syst. Veg. vii, 1322 excl. Lam. Illustr. and excl. syn. except Lour.; Mart. Hist. Nat. Palm. iii, 208 (1st edit.) and 342; Kunth Enum. Plant. iii, 206; Walp. Ann. iii, 342 and v. 832; Griff. in Calc. Journ. Nat. Hist. v, 35 and Palms. Brit. Ind. 43; Miq. Fl. Ind. Bat. iii, 138; H. Wendl. in Kerch. Les Palm. 237; Hook. fil. Fl. Brit. Ind. vi, 461; Becc. in Rec. Bot. Surv. Ind. ii, 215.

C. micranthus Bl. Rumphia, iii, 33, pl. 151? (only as to the leaves).

Dæmonorops fissus, Bl. l. c. 17 pl. 144 fig. A. B. C and as to the descript. of the leaves only?

Calamus from Ching, Griff. in Calc. Journ. Nat. Hist. v, 37 and Palms Brit. Ind. 46 (note).

DESCRIPTION.—Scandent, usually large, but somewhat variable in size. *Sheathed stem* 3–6 cm. in diam.; naked canes 1·5–2·5 or almost 3 cm. in diam.; the internodes very elongate (up to 80 cm. long) smooth polished, spadiceous when dry, slightly clavate or gradually thickened upwards, subterete or with a very obtuse and superficial longitudinal keel changing side at every internode. *Leaf-sheaths* flagelliferous, thickly coriaceous or almost woody, glabrous, polished, gibbous above, cylindraceous, with an obtuse longitudinal keel (as in the naked canes) descending downwards from the insertion of every spadix or flagellum; the lower sheaths apparently far more elongate than the upper ones, all more or less sparingly armed with robust solitary or occasionally geminate or ternate, horizontal or more or less deflexed spines, which are laminar, elongate triangular, subulate, 1·5–3 cm. long, with a broad and underneath concave base; the spines being erect in the præfoliation leave a distinct impression of their outline above them on the surface of the sheath. *Ocrea* short (1 cm. long at most in nearly expanded leaves), glabrous, the margin scarious, brittle and ultimately deciduous. *Leaf-sheath flagella* excessively long, up to 4–5 m., with a very conspicuous callus at their insertion, flattened and acutely two-edged in their basal part where usually armed at the edges with straight horizontal spines, terete from the middle upwards and strongly armed there with robust black-tipped and towards the summit half-whorled claws. *Leaves* not cirriferous, large, 1·5–2·2 m. long; petiole very variable in length (from 10 to 50 cm.) robust 1·5–2 cm. broad, half-terete or flattish and smooth above, and rounded beneath, where usually smooth along the middle or sometimes sparingly clawed there; the margins armed with straight or slightly hooked spines; rachis in recently expanded leaves covered with a rusty cottony scurf, later glabrous, bifaced above in its upper part and with an acute smooth angle there, somewhat irregularly armed beneath, chiefly along the middle, with at first solitary and towards the summit often ternate claws; leaflets numerous, 20–30 on each side, alternate or subopposite, equidistant, rather remote, usually 7–10 cm. apart and in very stout leaves 4–5 cm. only, rigid papyraceous, subshining on both surfaces, very slightly paler beneath, elongate-lanceolate or lanceolate-ensiform almost equally narrowed to both ends, callous at their insertion, gradually acuminate at the summit into a bristly-penicillate apex, plicate (chiefly at the base) and 3–5-costulate, the costa nearer each margin (when 5) often evanescent from the middle upwards and usually naked, the 3 of the centre bristly in their upper part; the bristles 4–6 mm. long, brown and patent; beneath, all nerves fainter and only the mid-costa sometimes sparingly bristly; transverse veinlets rather sharp, rather remote and interrupted; margins acute naked; the lower margin in the upper surface usually bordered with a narrow polished shining band; the largest leaflets 50–60 cm. long and 5–5·5 cm. broad, the upper ones much reduced in size, the two of the terminal pair unequal, free at the base, sometimes not more than 15–20 cm. long and 1–2 cm. broad; a few at the base also smaller than the intermediate ones. *Male spadix* ultra-decompound, very long, sometimes as much as 6 metres, pendulous, with 7–8 very remote partial inflorescences, terminating with a rather long prickly flagelliform appendix; primary spathes tubular, narrow, very long, very closely sheathing, thinly coriaceous, entire; the lowermost about 45 cm. long flattened acutely two-edged, the edges more or less armed with slender straight spines, the succeeding one less flattened, the upper ones cylindraceous, very slightly narrowed to the base, where flat or channelled on the inner side, more or less aculeate on the back, chiefly in their upper part, very obliquely truncate, entire and naked at the mouth and prolonged at the summit into a triangular acuminate dorsally keeled erect point; partial inflorescences inserted inside near the mouth of their respective spathes; the lower ones, the largest, slender, 50–60 cm. long with 9–10 secondary branches on each side, the upper ones shorter; secondary spathes pergamentaceous, elongate-infundibuliform, 3–4 cm. long, rather loosely sheathing in their upper part, polished, smooth or very sparingly prickly on the back, obliquely truncate, entire and ciliate-paleaceous at the mouth, prolonged at one side into a triangular acute erect point; branchlets 10–12 cm. long, with 8–10 distichous spikelets on each side, their spathes 5–10 mm. long, asymmetrically infundibuliform, unarmed, truncate, entire and ciliate at the mouth, prolonged at one side into a triangular point; spikelets spreading, small, about 2 cm. long, with 10–12 distichous flowers on each side; spathels bracteiform, very approximate, concave, ciliolate, acuminate at one side; involucre cupular, shallow, striately veined, obliquely truncate, deeply excavate, bidentate and acutely two-keeled on the side next to the axis. *Male flowers* seen by me only in a too young state to be described. *Female spadix* simply decompound, excessively long (6–7 m.), with 7–9 very remote partial inflorescences and terminating in a long clawed flagellum; primary spathes as in the male spadix, in one specimen strongly armed with very robust solitary or even confluent and digitate claws; partial inflorescences very long, the lower ones, the largest, as much as 1–1·8 m. long with 15–20 distichous spikelets on each side, those near the summit 40–60 cm. long with proportionally fewer spikelets; secondary spathes as in the male spadix, unarmed or more or less aculeate, especially in their upper part; spikelets inserted just outside the mouth of their own spathe with a distinct axillary callus, deflexed, rigid, vermicular; the lower ones of the largest inflorescences 15–18 cm. long with 30–36 almost horizontal flowers on each side; those of the smaller inflorescences 8–10 cm. long with 18–20 flowers on each side; spathels very short, broadly asymmetrically infundibuliform, ciliate-furfuraceous at the margins, at least when young, finely striately veined, prolonged at one side into a short spreading point; involucrophorum subtended by its own spathel and laterally attached to the base of the one above; involucre very shallowly cupular or almost explanate and disciform with unequal margin, more or less acutely bidentate on the side of the neuter flower, of which the areola is very conspicuous, lunate and sharply bordered. *Female flowers* about 4 mm. long. *Fruiting perianth* shortly but distinctly pedicelliform, glabrous, smooth; the calyx indurated and often depressedly ventricose at the base, shortly and broadly 3-dentate; segments of the corolla narrower and slightly longer than the teeth of the calyx; stamens with filaments connate into a short urceolum at the base and suddenly linear from a broad base in the free part, as long as the lobes of the corolla. *Fruit* small, broadly ovoid or sub-obovoid, 13–14 mm. long, 8 mm. broad, very suddenly and shortly beaked; scales in 15 series, shining, convex, channelled along the middle, very dark brown (when dry) with paler scarious finely erosely-toothed margins, tip short rather obtuse. *Seed* broadly ovate, coarsely pitted on the back, the chalazal fovea elliptic on the raphal side; albumen equable except for a few superficial intrusions of the integument; embryo basal. All parts of the plant, stem, leaves and spadices, acquire a cinnamon brown colour in drying.

HABITAT.—The Malayan Peninsula: district of Perak (*Scortechini* No. 501^b); in the same district on Gunong Malacca (*King's collector* No. 7171 in Herb. Calc.) and near Malacca at Ching (*Griffith*). I have seen no specimens from Sumatra, but Griffith writes that the main place of export of the canes produced by this *Calamus* is Siak, a small town facing Singapore on the East coast of that Island. From

Billiton I have a specimen collected there by Riedel. In Borneo it has been found by Low, probably in Sarawak (Herb. Kew.), but it must be very scarce there, as I have never met it. Dr. Treub forwarded me some splendid specimens made from plants grown at Buitenzorg from seeds gathered by Mr. Strichman on the West Coast of Borneo. It mainly grows in damp forests near the sea. In the Malayan Peninsula it receives the name of "Rotang Semanbu" (*Scortechini*); in Billiton of "R. Simanbo" (*Riedel*); in Borneo of "R. Marow" (*Low*).

This species supplies the well-known commercial Malacca canes brought to the markets of Singapore and Pinang in pieces of the length of about 1·8 m. and consisting of only 3 joints or nodes with only an entire very long internode. The longest internode I have seen is preserved in the Botanical Museum at Florence, and is 88 cm. in length. The diameter of the canes is very variable, some being as thick as a man's little finger and others attaining 3 cm. in diam. I have not seen leafy specimens of the thinner canes, but I can scarcely doubt their belonging to the same species as the larger ones. The Rotang of *C. Scipionum* is valued only for the sticks and handles it produces, and is not employed for other purposes.

Observations.—The leaves in *C. Scipionum* cannot be called subcirriferous, but they approach this kind of termination, as the leaflets near the summit are very much reduced in size and the last one is often rudimentary, while the rachis is more or less, never however very powerfully, clawed.

This name of *C. Scipionum* has been given by Loureiro to the plant producing the well-known commercial Malacca canes, and only through them has it been possible to recognize this species, the description left of it by its author not serving as a sure means of identification.

Griffith had known this *Calamus*, as it is easily recognized in the short but characteristic description of the *Calamus* from Ching, but Griffith never assigned a specific name to it. As far as I know no other Palm produces such long internodes as those of this *Calamus*, but perhaps these are not of such extraordinary length throughout the entire plant, and the very long ones are produced only near the base of the plant, when this is at a maximum of its vigour.

The leaflets figured by Blume in the plate 191 of the "Rumphia" with the name of *C. micranthus* are very seemingly those of *C. scipionum*; and the same may be said for those represented in the plate 144, f. A. B. C. as those of *Daemonorops fissus*.

C. Scipionum seems a very variable species, and to the comprehensive description given above I do not think it out of place to add the following observations on the different specimens from which I have derived it:—

I. I consider as type-specimens those of the Malayan Peninsula (Calcutta Herbarium No. 7171) and of Scortechini (No. 501^b). These last bear male spadices, and the first a portion of a partial inflorescence, this with very young fruit and terminated as in all other specimens of different origin by a slender, short, (12 cm. long) sheathed unarmed appendix. The secondary spathes bear only 1 or 2 solitary very small claws; the spathels are very short and approximate with a deflexed point, the flowers being very crowded; involucrophorum quite sessile; involucre irregularly lobulate-crenate; fruiting perianth with very short depressed ventricose calyx; fruit scales very dark coloured; the leaf accompanying the above-mentioned inflorescence is very robust; the sheath is 6 cm. in diam., the petiole short (10 cm.) prickly at the margins, but not beneath; the largest leaflets relatively short and broad (40 cm. long by 5–5·5 cm.) with five costae, sometimes all, but usually 3 only setose.

II. The specimen from Billiton resembles much those of the Malayan Peninsula but the secondary spathes are rather densely aculeate all round; the spathels shortly cyathiform; the involucrophorum quite sessile, and the involucre 2–3-lobed, the lobes acute; the calyx, as in Malacca specimens, depressed ventricose.

III. The specimens cultivated at Buitenzorg and coming from the west coast of Borneo agree pretty well with those of Malacca, but the fruiting perianth has a very short tube, which is not depressed-ventricose; the leaves have a moderately long petiole, which is armed at the margins only; the secondary spathes are unarmed or furnished with a few small claws; spathels short; involucrophorum sessile; involucre with uneven margin, lobulate or denticulate.

IV. Another cultivated specimen from Buitenzorg without any notice about its origin is very robust, with leaf-sheaths 6 cm. in diam.; petiole 25 cm. long, strongly armed at the sides with often geminate spines, and furthermore with strong solitary claws along the middle beneath; leaflets more closely set and more numerous than usual (about 60 in all), of which many with 5 setose nerves above; secondary spathes unarmed or very scarcely aculeate; fruiting perianth truncate at the base, with very short not ventricose calyx. The fruit as described above.

V. Other specimens cultivated at Buitenzorg with the No. 3784 have the leaves as in those coming from the Malayan Peninsula, but the petiole is very long (as much as 40 cm.), armed at the sides, unarmed below along the middle in the first portion and clawed only towards the summit. A female spadix with the fruit fallen away has the lowest partial inflorescences very large and some of the spikelets nearly 20 cm. long, and in some cases, in the lowest portion of the spikelet, the involucrophorum has a tendency to become pedicellate; the spathels are also more elongate than in the above-described specimens and are tubular-infundibuliform, attaining up to 5 mm. in length. It seems that these last peculiarities are more apparent in the inflorescences of the upper portion of the spadix, where the involucrophorum with the involucre, more than elsewhere, protrudes from its own spathel.

VI. The specimen of the Kew Herbarium collected by Low in Borneo has a leaf-sheath 3·5 cm. in diam. armed with few very broad solitary or sometimes more or less aggregate spines; the petiole bears a few long straight spines at the margins; the rachis is armed in the mesial portion with strong solitary claws. The leaflets are alternate, 8 cm. apart at one side, reaching to 60 cm. in length and 5–6 cm. in breadth, with 5 nerves sparsely setose above, naked below.

PLATE 155.—Calamus Scipionum *Lour.* Portion of the sheathed stem with the base of a leaf and an entire flagellum; an intermediate portion of the leaf (under surface); the summit of a leaf (upper surface); portion of the male spadix with an entire primary spathe and an entire partial inflorescence.—From Scortechini's specimen No. 501^b in Herb. Becc.

PLATE 156.—Calamus Scipionum *Lour.* Upper part of a leaf-sheath with the base of a leaf; an intermediate portion of a leaf (under surface); an entire partial inflorescence with almost mature fruit.—Specimen in Herb. Becc. from a plant cultivated at Buitenzorg.

133. CALAMUS DENSIFLORUS Becc. in Hook. fil. Fl. Brit. Ind. vi, 445 and in Rec. Bot. Surv. Ind. ii, 205.

DESCRIPTION.—Scandent. *Sheathed stem* 3–4 cm. in diam. *Leaf-sheaths* thick, subligneous, gibbous above, truncate and naked at the mouth, strongly armed with flattened, horizontal, short spines, which have a swollen and broad base. *Leaf-sheath flagella* very robust and long, strongly clawed. *Ocrea* very short, annular. *Leaves* not cirriferous, large, 2–2·6 m. long (King's collector); petiole almost reduced to nothing, as the lowest leaflets are attached very near the mouth of the sheath; first portion of the rachis slightly biconvex with narrow flat (not channelled) sides where are inserted the leaflets, prickly above and armed beneath at the sides and along the middle with scattered claws; the upper portion of the rachis bifaced and smooth above and rather densely armed beneath with stout solitary or irregularly approximate broad-based claws; leaflets numerous, closely equidistant, greenish even when dry, subshining above, slightly paler beneath, linear-ensiform (the lowermost remarkably narrower, but not much shorter than the others), rigidulous, attenuate at the base, gradually acuminate into a very subulate apex, the mesial and still more the uppermost less acuminate; these last distinctly indented on the lower margin near the apex; the larger ones (the mesial) 34 cm. long and 14–16 mm. broad, rather suddenly decreasing in length towards the summit; the two of the terminal pair very small, 5–7 cm. long, 2–5 mm. broad, quite free at the base—all rather distinctly 3-costate, the broad mid-costa very acute and prominent above where spinulous only, near the summit the side costae more slender and remotely spinulous throughout, very finely longitudinally striately veined under the lens beneath, where the mid-costa only is sparsely bristly-spinulous; margins slightly thickened by a secondary nerve, furnished with small remote and adpressed spinules, these more spreading near the apex. *Male spadix* supradecompound, apparently very similar to the female one, very elongate with closely sheathing cylindraceous prickly primary spathes, and with very remote partial inflorescences; these (only one seen by me) inserted outside and coming forth erect from their own spathe, loosely pyramidate, 25 cm. long, exactly like the female ones, but with 2–3 compound spikes or spicigerous branches on each side in their basal part and 4–5 gradually diminishing simple spikelets at the summit; secondary spathes unarmed, tubular-infundibuliform, closely sheathing, obsoletely angular; branchlets arched, the lower ones 7–8 cm. long, with 7–8 spikelets on each side; tertiary spathes infundibuliform; spikelets arched, the larger ones, the lowest of every branchlet, about 2 cm. long with 13–15 almost horizontal very closely packed flatly bifarious flowers on each side; spathels very approximate, bracteiform with a broadly triangular ciliate deflexed point, this subtending its own flower; involucre shallowly cupular, somewhat irregularly 2–3-lobed. *Male flowers* ovoid (when young); the calyx distinctly striately veined; spathels, involucres, and flowers covered with small loose rusty-furfuraceous scales. *Female spadix* elongate, prolonged at the summit into a very long flagellum, this in one specimen 1·5 m. long and strongly armed with solitary, geminate or even ternate claws; partial inflorescences remote, not numerous, broadly paniculate, rather short and dense, terminating with a small unarmed tail-like appendix, the basal, the largest, 26 cm. long in one specimen, and with 6 spreading spikelets on each side, the upper ones shorter and with fewer spikelets; primary spathes very long, tubular, closely sheathing, armed chiefly towards their summit with scattered, short, very broad-based prickles, truncate and naked at the mouth, where acute at one side; the upper ones cylindraceous, the lowermost somewhat flattened and acutely two-edged; unsheathed axial portions between two partial inflorescences very long and very powerfully clawed; secondary spathes unarmed, very strictly sheathing, tubular, slightly infundibuliform or somewhat narrowed at the base, obsoletely angular, truncate, entire and furfuraceous-ciliolate at the mouth; spikelets inserted above the mouth of their own spathe with a distinct axillary callus, spreading, arched, thick, somewhat flattened, the lower ones the largest, 7–9 cm. long, with 10–16 flowers on each side, the uppermost somewhat shorter; spathels very closely packed, deeply concave, subbracteiform or almost boat-shaped, furfuraceous like the other parts of the spikelet, acute at one side, striately veined; involucrophorum cupular, almost exsert from its own spathel, which is slightly pushed down by it; involucre deeply and regularly cupular, inserted into the involucre and not longer than this, with the margin almost entire or superficially undulate; areola of the neuter flower lunate, not very sharply defined. *Female flowers* bifarious, very closely packed, rather large, about 5 mm. long. *Fruiting perianth* shortly pedicelliform, the calyx campanulate, smooth at the base (in the portion enclosed in the involucre), sharply and deeply striately veined and scabrid-furfuraceous upwards, divided down about to the middle into three broad lobes; the corolla with the segments not polished outside, as long as but narrower than the lobes of the calyx. *Fruit* closely packed, not regularly bifarious, obovate, suddenly and stoutly beaked, 15–17 mm. long including the beak, 1 cm. in diam., somewhat tapering towards the base, sometimes deformed by mutual pressure; scales in 18 series, shining, slightly channelled along the middle, straw-yellowish with a rather broad reddish-brown intramarginal line, somewhat prolonged into an acute point, the margins scarious, very finely fringed, chiefly at the point. *Seed* ovoid-elliptic, round to both ends, about 1 cm. long and 7 mm. thick, deeply pitted and deeply ruminated, with a narrow and deep circular chalazal fovea on the centre of the raphal side and with the embryo almost on the centre of the opposite face.

HABITAT.—Singapore on Bukit Mandai (*Ridley* No. 6280 (♀) in Herb. Becc.); and in the garden jungle (*Ridley* No. 10861 (♂) in Herb. Kew). The Malayan Peninsula in the district of Perak at Thaiping, No. 8434, and at Larut, No. 5527 (*Sir. G. King's collectors* in Herb. Calc.).

OBSERVATIONS.—By its ruminated seed with lateral embryo this enters into the group with *C. gracilis* and *C. melanacanthus*, though somewhat departing from these in its general habit. It seems related to *C. Ridleyanus.* Its characteristics amongst the species of the group are the leaf-sheaths armed with short broad-based prickles; the numerous approximate equidistant narrow 3-costate leaflets; the long strongly clawed flagelliferous female spadix with rather short partial inflorescences; the thick spikelets with very approximate flowers; the fruit obovate, stoutly beaked, closely and irregularly packed round the axis of the spikelet.

Plate 157.—Calamus densiflorus *Becc.* The basal portion of a leaf; an intermediate portion of the same leaf from underneath; portion of the fruit-spadix with an entire partial inflorescence; the seed longitudinally cut in two halves.—From Ridley's specimen No. 6280 in Herb. Becc.

134. Calamus Ridleyanus Becc. in Rec. Bot. Surv. Ind. ii, 205.

Description.—Scandent, of moderate size. *Leaf-sheaths* . . . . . *Leaves* large, subcirriferous, terminating in a finely and densely clawed rachis with very diminutive leaflets; petiole apparently short, deeply channelled above, armed at the sides with slender horizontal spines; rachis in its first portion, broadly channelled in the centre and with a narrow channel on each side, where are attached the leaflets, irregularly and rather densely armed beneath with stout solitary light-based and black-tipped claws, these ternate and more regularly set towards the summit, where the rachis is trigonous with an acute angle; leaflets numerous, equidistant or nearly so, not very crowded, often disposed in the upper portion of the rachis in opposite pairs (these 4–5 cm. apart), ensiform or lanceolate-ensiform, gradually narrowed towards the base, subulately acuminate into a bristly apex, rather firm, papyraceous, green on both surfaces, shining and with three acute and smooth costae above; beneath the three costae faint but bristly in their anterior portion; margins quite smooth, slightly thickened by a secondary nerve; transverse veinlets slender but very distinct; the largest leaflets, the intermediate ones, 45 cm. long and 2·5 cm. broad, the upper ones gradually smaller, those of the summit very small, a few cm. in length. *Male spadix* . . . . . *Female spadix* simply decompound, rather robust, flagelliform, very elongate, in one specimen 3 metres long, including the slender terminal, 70 cm. long, clawed flagellum, and with 3 very remote simple very long partial inflorescences; lowest primary spathe strictly tubular of uniform diameter throughout, biconvex and very slightly two-edged, obliquely truncate and paleaceous-ciliate at the mouth, very densely armed with very small scattered horizontal black-tipped and light-based, 1–3 mm. long prickles; upper primary spathes cylindraceous, very long, very strictly sheathing, densely armed like the lowest spathe, but the prickles deflexed, prolonged at the summit into a lanceolate point; main axis of the spadix almost terete in its elongate lower portion where 5–6 mm. in diam., armed with strong solitary or aggregate and sometimes half-whorled claws; in its upper portion the axis in the parts corresponding to the elongate base of the spathes is flat inside, very acute at the sides, convex and clawed on the back; partial inflorescences robust, rigid, straight, very long, the lower ones the largest, 75–90 cm. long with 9–12 spikelets on each side and terminating in a narrow tail-like aculeolate sheathed appendix; the upper inflorescences shorter and with fewer spikelets; secondary spathes finely scaly-furfuraceous when young, tubular-infundibuliform, 3–4 cm. long, somewhat narrowed at the base where smooth, but otherwise densely covered, chiefly on the outside and near the summit, with very small recurved prickles, these resting on a tuberculiform base and prolonged at one side into an erect broad exsuccous and ultimately decayed point; spikelets vermicular, thick, inserted inside the mouth of their own spathe, conspicuously arched downwards, all about of the same dimensions, 7–11 cm. long with numerous very closely packed distinctly 4-farious flowers, as the neuter flowers are very similar to and as large as the fertile ones; spathels very short, very approximate, partially enclosed one inside the other, very broadly infundibuliform without a tubular portion, truncate, entire and ciliolate at the margin, not or obscurely apiculate at one side, rusty-furfuraceous, finely striately veined; involucrophorum cupular, almost enclosed in its own spathel; the involucre as long, cupular, rather deep, with an entire margin; areola of the neuter flower lunate; sharply bordered, large and deep, slightly smaller than the involucre. *Female flowers* ovoid, about 4 mm. long; the calyx shortly 3-dentate, scaly-furfuraceous; the corolla slightly longer than the calyx; staminal urceolum crowned by very short filaments, anthers sagittate, small. *Neuter flowers* barely differing externally from the fertile ones; only the corolla is somewhat longer than the calyx; stamens with the filaments connate at the base, subulate, rather thick in the free part; anthers rather large, sagittate (apparently sterile); abortive ovary formed by 3 elongate bodies about as long as the anthers.

HABITAT.—Singapore, in the wild part of the Botanic Garden, *Ridley* No. 3504 and No. 6901.

OBSERVATIONS.—This species has considerable affinity with *C. densiflorus*, but the fruit not being known its position remains doubtful. The chief distinctions are the shining leaflets with smooth margins and with 3 costae, smooth above and bristly beneath, the very long rigid partial inflorescences with many thick arched spikelets; the flowers in the female spadix distinctly 4-seriate, viz. with 2 series of female flowers and two of neuters; these last very similiar to the fertile ones. Mr. H. N. Ridley writes to me (August 1902) that of this species there are two plants in the Garden Jungle at Singapore—one male, the other female, but they never have produced fruit; the supposed male plant, however, is probably that of *C. densiflorus*, according to Ridley's specimen in the Herb. at Kew.

PLATE 158.—Calamus Ridleyanus *Becc.* The upper part of a leaf; the terminal portion of the spadix with two partial inflorescences from Ridley's No. 3504 in Herb. Becc.

135. CALAMUS ZEYLANICUS Becc. in Hook. fil. Fl. Brit. Ind. vi, 455, and in Rec. Bot. Surv. Ind. ii, 210.

C. rudentum (not of Lour.) Thw. Enum. Pl. Zeyl. 330 (excl. all syn.) and C. P. exsicc. No. 2874 (see Hance in Journ. of Bot., 1874, 262).

DESCRIPTION.—Apparently very high scandent, large and robust. *Leaf-sheaths* . . . . . *Leaves* of the adult plant very large, very probably cirriferous, but not seen entire by me; petiole . . . . . ; rachis (from a portion above the middle) robust, bifaced above with the upper angle and side margins acute and smooth, rounded beneath, where armed with robust claws, solitary at first and 3-nate upwards; leaflets numerous, equidistant, 1·5–3 cm. apart, papyraceous, almost shining above, opaque and slightly paler beneath, ensiform or very narrowly elongate-lanceolate, 25–35 cm. long, 2 cm. broad, narrowed to the base, acuminate at the summit into a slender bristly-caudate tip, with a rather deep indentation on the lower margin about 2 cm. from the apex and furnished with 3 slender costae, which are very sparingly bristly on the upper surface; on the lower surface all nerves very slender, the mid-costa closely covered with fine and short bristles and 3–5 other very slender nerves on each side of it also covered all along with hairs or very small and short bristles, which rest on a small bulb; transverse veinlets slender, rather distinct; margins slightly thickened by a slender marginant nerve, very adpressedly spinulous. *Male spadix* ultradecompound, not flagelliferous, apparently very large, not seen entire; partial inflorescences panicled pyramidate, rather dense, with many rather approximate branchlets, which are inserted inside at the bottom of their own spathe and are 15–20 cm. long, with 12–16 spikelets on each side; primary spathes . . . . . ; secondary spathes short (2–3 cm. long), tubular-infundibuliform, horizontally truncate, entire and scaly-ciliolate at the mouth, smooth or very sparingly spinulous; tertiary spathes (spathes of the branchlets) shortly tubular-infundibuliform, 4–5 mm. long, truncate, slightly apiculate at one side; spikelets broad and flat, 15–20 mm. long, inserted with a narrow pedicel to the bottom of their respective spathe, with 12–15 very closely set, flatly bifarious flowers on each side; spathes very closely packed, concave-subcymbiform, imbricate or partially enclosed one into the other, horizontally truncate, entire, rounded at both sides; involucre enclosed into its own spathel, two-keeled, bidentate and lunately excavate on the side next to the axis. *Male flowers* small oblong, often slightly curved, 4–5 mm. long when full grown; the calyx thin, membranous, not distinctly veined, divided down about to the middle into 3 semi-ovate lobes and usually cleft down to the base; the corolla somewhat longer than the calyx, its segments lanceolate pergamentaceous, acute, finely striate; anthers versatile; rudimentary ovary oblong, 3-sulcate. *Female spadix* very different from the male one, simply decompound, very large, not flagelliferous at the apex and terminating with a short (10 cm.) rigid tail-like prickly appendix; upper primary spathes (the lowermost not seen by me) elongate, tubular-cylindraceous, slightly enlarged above, thinly coriaceous, often split on the ventral side, prolonged at the summit into a short limb, aculeolate on the back in their upper part; partial inflorescences large, 40–60 cm. long and perhaps even more, rigid, diffuse, with many spikelets (5–8 cm. apart) on each side; secondary spathes tubular, slightly infundibuliform, 2·5–4 cm. long, truncate at the mouth, smooth or very sparingly spinulous; spikelets robust, 10–16 cm. long, the upper ones somewhat shorter, pedicellate and inserted at the bottom of their own spathe, with 10–18 distichous flowers on each side; spathels short, infundibuliform, horizontally truncate, thinly coriaceous, not or obsoletely striately veined, very slightly extended and acute at one side (that of the flower) where usually split; involucrophorum calyciform narrowed at the base and inserted at the bottom of its own spathel, and therefore pedicellate, bidentate, two-keeled and lunately excavate on the side next to the axis; involucre obliquely cupular, rather deep, exceeding the involucrophorum on the side of the neuter flower; areola of the neuter flower ovate or elliptic, slightly concave, rather sharply defined. *Female flowers* about 6 mm. long; the calyx almost entirely split into 3 ovate, concave, acute, finely striately veined parts; the corolla slightly longer than the calyx, divided from the base into 3 lanceolate acuminate, striately veined segments; staminal urceolum shorter by one-half than the corolla and crowned by six broadly triangular teeth; sterile anthers small, deeply sagittate; ovary ovate; style short; stigmata elongate, recurved, lamellose-tuberculate inside. *Fruiting perianth* explanate, but subtended by the subpedicelliform involucrophorum. *Fruit* (when quite ripe) sphæric, about 18 mm. in diam., topped by a distinct conic beak, this 4 mm. long; scales in 18 series, very convex, deeply channelled along the middle, dirty straw-yellowish, almost as broad as long (4·5 mm.) with a very narrow dark intramarginal line, margins light, scarious very finely erosely-toothed, tip obtuse adpressed. *Seed* globular, about 12 mm. in diam., finely tubercled and pitted; the chalazal fovea circular and deep, penetrating to the centre of the albumen, but like all other unevenness of the surface covered with the very adherent (when dry) thin integument; albumen bony, very deeply ruminate; embryo subbasal.

HABITAT.—Ceylon, at Sassafragam in the hottest parts of the Island, *Thwaites* C. P. No. 2874. With this number have been also distributed portions of the leaves which apparently belong to *C. ovoideus.* Singalese name "Ma-Waiwel" (Thwaites).

OBSERVATIONS.—The specimens of the male and female spadices of this species distributed by Thwaites with the No. 2874 are accompanied by portions of leaves which evidently belong to two quite distinct species. I have considered as belonging to *C. zeylanicus* those which have the leaflets shining above and opaque beneath with 3 slightly bristly costae above and the mid-costa with 3–5 very slender nerves on each side of it, finely and closely hairy in the lower surface. The other portions of leaves, which I consider as belonging to *C. ovoideus,* have the leaflets shining on both surfaces with long bristles on 3 nerves in the lower surface, and the upper surface usually bristly on the two side nerves only. The distinctive characters of this fine species are the large cirriferous leaves, the leaflets numerous, equidistant, narrow, with many very slender hairy nerves beneath, the large panicled male spadix very different from the female one with small flattened spikelets; the female spadix with long robust spikelets; the male and female spikelets inserted with a pedicel to the bottom of their respective spathe—a peculiarity also reproduced in the involucrophorum; the explanate perianth; the sphæric, rather large, distinctly beaked fruit; the ruminated albumen.

C. zeylanicus approaches in many respects to *C. ovoideus,* but this has a seed with almost equable albumen, while it is deeply ruminated in the first – a difference which however is of not very great importance in the genus *Calamus.* I have not seen the apex of an adult leaf of *C. zeylanicus,* but I have little or no doubt that it terminates in a robust clawed cirrus; consequently the leaf-sheaths ought to be without a flagellum.

PLATE 159.—Calamus zeylanicus *Becc.* Lower portion of a partial inflorescence with immature fruit (C. P. No. 2874 in Herb. de Cand.); small portion of a male spadix and portion of a female spadix with mature fruit; seed entire and one

longitudinally cut through the embryo (from C. P. No. 2874 in Herb. Boiss.). The intermediate portion of the leaf (upper surface) is supposed to belong to *C. ovoideus*, but was united to the portion of spadix of *C. zeylanicus* with immature fruit in the Herb. de Candolle.

PLATE 160.—Calamus zeylanicus *Becc.* An entire partial inflorescence of a female spadix in flower, with the upper part of a primary spathe (C. P. No. 2874 in the Herb. Deless.); an intermediate portion of a leaf from underneath (on the upper left corner, from C. P. No. 2874 in the Herb. de Cand); an intermediate portion of a leaf from above (on the lower right-hand corner, from C. P. No. 2874 in Herb. Boiss.).

136. CALAMUS OVOIDEUS Thw. ex Trimen in Journ. of Bot. 1885, 269; Hook. f. Fl. Brit. Ind. vi, 457; Becc. in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—High scandent and robust. *Leaf-sheaths* (seemingly not flagelliferous) with many approximate rings formed with broad laminar black, often lacerate spines (*Trimen*). *Leaves* large, 4 m. long (*Trimen*) including the terminal cirrus, this armed at regular intervals with half-whorls of strong black-tipped claws; petiole . . . . . ; rachis robust, flattish or broadly and shallowly channelled on the upper surface of its basal portion, its margins strongly armed with small ascendent spinules, deeply furrowed at the sides where are inserted the leaflets, beneath armed at first with solitary claws, which become 3–5-nate upwards; leaflets numerous equidistant alternate, papyraceous, elongate-ensiform, slightly narrowed to the base, where not very acute and suddenly plicate at their insertion, very gradually acuminate towards the apex and lengthened out into a subulate setose tip, this more or less deeply indented on the lower margin 2–3 cm. from the apex, 3-or sub 5-costulate, 3 costae bearing long spadiceous bristles on the lower surface especially towards the apex and a few also on the upper one, papyraceous, green and subconcolorous on both surfaces; transverse veinlets very fine, approximate, sinuous, much interrupted; margins very remotely adpressedly and inconspicuously spinulous; the largest leaflets seen by me, apparently belonging to the intermediate portion of the leaf, 55 cm. long 23 mm. broad. *Male spadix* . . . . . *Female spadix* not flagelliferous at its summit, large and diffuse, decompound, brown in every part when dry; primary spathes coriaceous, tubular, somewhat enlarged above, sparsely armed with very short scattered deflexed spines; partial inflorescences robust, the one seen by me 60 cm. long, with distichous spikelets on each side and terminating in a short smooth tail-like appendix; secondary spathes about 2 cm. long, tubular, slightly infundibuliform, unarmed, thinly coriaceous, often longitudinally split, rather loosely sheathing, truncate and entire at the mouth, where extended at one side into a short broad triangular point; spikelets robust, slightly arched, spreading, attached inside and at the bottom of their own spathe, stalked by a narrow flattened pedicelliform part, this therefore about as long as the respective spathe, terminating in a very short diminutive caudiculum (8–10 cm. long) with 14–16 distichous flowers on each side; spathels broadly and shortly infundibuliform, horizontally truncate, thinly coriaceous, not or obsoletely striately veined, very slightly extended and acute at one side (that of the flower) where usually split; involucrophorum calyciform, narrowed at the base and inserted at the bottom of its own spathel and therefore subpedicellate, irregularly lobulate at the margin and obsoletely 2-keeled on the side next to the axis; involucre irregularly or somewhat unilaterally cupular, slightly exceeding the involucrophorum; areola of the neuter flower hidden between the involucra, small, vertically evolute, elliptic-acute, sharply bordered. *Neuter flowers* small, often persistent. *Female flowers* ovoid, about 5 mm. long. *Fruiting perianth* explanate but subtended by the subpedicelliform involucrophorum; the calyx split to the base into three ovate lobes; the segments of the corolla slightly narrower and as long. *Fruit* obovoid, oblong, somewhat tapering towards the base, rounded at the summit where topped by a small conic beak, 15–16 mm. long and about 1 cm. broad; scales in 18 series, deeply channelled along the middle, subshining, light brown, very slightly prolonged into a rather obtuse point, with a very narrow rusty-brown intramarginal line, their margin narrowly scarious, finely erosely-toothed. *Seed* ovoid, rounded at both ends, 11 mm. long, 8 mm. broad, 6 mm. thick, slightly flattened and with an elongate chalazal fovea on the raphal side, not very deeply and irregularly grooved on the back; albumen equable as the depressions of the surface are too shallow for a permanent intrusion of the integument; embryo basal.

HABITAT.—Ceylon. The western provinces in the district of Saffragam, *Thwaites* C. P. No. 3925.

OBSERVATIONS.—As I have already pointed out when speaking of *C. zeylanicus*, the specimens of the leaves distributed by Thwaites of this have been apparently mixed with those of *C. ovoideus.* These two species are certainly related and have many characters in common, but the seed of *C. zeylanicus* is deeply ruminated, whereas that of *C. ovoideus* has only some slight depressions on its surface where the intrusions of the integument are very superficial, and consequently the seed cannot be called ruminate. Of the type-specimens I have seen a few female partial inflorescences with mature fruit and different fragments of the leaves, but not the leaf-sheaths which are described after Trimen. In the Calcutta Herbarium the specimen of a portion of the fruit-spadix is accompanied by the summit of a non-cirriferous leaf with the leaflets as described above; this leaf seemingly is from a young plant or from the lower part of the stem.

The main characters of *C. ovoideus* are the leaves with rachis spinous at the sides in the lower portion and on the angle upwards in the upper surface; the numerous equidistant ensiform very acuminate leaflets with long bristles on 3 nerves beneath and in the upper surface usually bristly on the two side-nerves; the large not cirriferous spadix with stout stalked inflorescences, the oblong obovate beaked fruit; the slightly irregularly furrowed seed and the non-ruminate albumen.

PLATE 161.—Calamus ovoideus *Thw.* Portion of the upper part of a leaf probably a radical one or of the lower part of the stem, seen from the upper surface; an entire partial inflorescence with mature fruit; two detached fruits; seed, side and front view; one seed longitudinally cut in two halves.—From C. P. No. 3925 in Herb. Kew.

137. CALAMUS POLYSTACHYS Becc. sp. n.

DESCRIPTION.—*Sheathed stem* 3·5–4 cm. in diam. *Leaf-sheaths* coriaceous, covered when young with a rusty cottony indumentum and ornamented in their upper part at short intervals with complete membranous broad rings which are very densely comb-like, fringed with long blackish shining rigid criniform bristles; the mouth is truncate and also very densely bristly. *Ocrea* indistinct. *Leaves* large, 2·5 m. long in the pinniferous part; the cirrus elongate, armed at regular intervals with $\frac{3}{4}$-whorled claws; petiole short, 10–15 cm. long, robust, very slightly channelled above, about 18 mm. broad, prickly and covered with rigid bristles or crinite at the base on the back and at the margins; rachis with 2 spinulous ridges above in its first portion, trigonous upwards and with spinous acute angle above; leaflets numerous, equidistant, alternate, 3–3·5 cm. apart, linear-ensiform, slightly narrowed to the base, where not very acute and suddenly plicate at their insertion, very gradually acuminate towards the summit and lengthened out into a subulate setose tip, this more or less deeply indented on the lower margin 2–3 cm. from the apex, papyraceous, slightly paler beneath than above, the largest 50 cm. long, 2 cm. broad, 3-costulate, the costae with rather long bristles on the upper surface, chiefly towards the summit; underneath the mid-costa closely, the side costae sparingly bristly; transverse veinlets minute and short; margins rather closely spinulous. *Male spadix* . . . . . *Female spadix* not flagelliferous at its apex, about 1 m. in length, pyramidate, diffuse, decompound, brown in every part when dry, with 4–5 gradually shortening distichous partial inflorescences on each side; primary spathes tubular, very closely sheathing, thinly coriaceous, 10–15 cm. long, smooth or very sparingly prickly; the lower ones conspicuously, the upper ones in a lesser degree flattened and all acutely two-edged, obliquely truncate, entire and naked at the mouth, prolonged at one side in a triangular dorsally keeled acute point; partial inflorescences distinctly stalked, inserted far inside their own spathe, the lower ones, the largest, 50–55 cm. long and terminating in a small spikelet or in an inconspicuous tail-like appendix, and composed of 18–20 secondary spathes, of which the lower ones bear 2–3 spikelets each, only the spathes near the summit show solitary spikelets; secondary spathes 2–3 cm. long, tubular, slightly infundibuliform, unarmed, thinly coriaceous, rather loosely sheathing, truncate and entire at the mouth, slightly prolonged at one side into a short obtuse or acute point; spikelets spreading, each distinctly stalked or furnished with a long flattened pedicel inserted at the bottom of their respective spathe; the largest, the lower ones, 6–8 cm. long, not including the pedicel, with 14–16 flowers on each side; spathes broadly and shortly infundibuliform, narrowed a good deal to the base, horizontally truncate, apiculate at one side, finely and rather obsoletely veined; involucrophorum calyciform, narrowed at the base and inserted at the bottom of its own spathel, bidentate, lunately excavate and acutely two-keeled on the side next to the axis; involucre irregularly or somewhat unilaterally cupular, slightly exceeding the involucrophorum; areola of the neuter flower very distinct and large, vertically ovate, concave, sharply bordered. *Female flowers* 3·5 mm. long; the calyx split into 3 oblong, finely obsoletely veined lobes; the segments of the corolla finely veined, slightly narrowed and as long as the lobes of the calyx. *Fruit* unknown.

HABITAT.—The native country of this species is unknown, as it is cultivated in the Botanic Garden at Buitenzorg without any special reference to its origin.

OBSERVATIONS.—Of this *Calamus* I have received from the Botanic Garden of Buitenzorg the entire upper part of a female plant. The spadices have very few growing ovaries left on the spikelets, from which it appears that the female flowers are smaller than those of *C. ovoideus;* but the most singular features of this species are the 2–3-nate spikelets at each secondary spathe; each spikelet having its distinct pedicel inserted in the bottom of the spathel, whereas in all other species of *Calamus* I am acquainted with, the spikelets are always solitary at each secondary spathe.

The armature of the sheaths a good deal resembles that of *Daemonorops mirabilis*, but the membranous comb-like rings fringed with criniform bristles are not, as in this last, turned in opposite directions and are, at least in the juvenile sheaths seen by me, all pointing upwards; they may however become deflexed by age.

Closely related to *C. ovoideus*; but it shows also undoubted affinities to *C. andamanicus.*

PLATE 162.—Calamus polystachys *Becc.* Leaf-sheath with base of a leaf; an intermediate portion of a leaf (upper surface); the summit of a leaf; intermediate portion of a female spadix with ovaries in course of development. From Herb. Becc.

138. CALAMUS ANDAMANICUS Kurz in Journ. Asiat. Soc. Beng. xliii, pt. 2 (1874) 211, pl. xxvii A and xxviii and xlv, pt. 2 (1876), 151, and For. Fl. Brit. Burma, ii, 519; Hook. fil. Fl. Brit. Ind. vi, 457; Becc. in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—Very large and high scandent. *Sheathed stem* as thick as the arm (up to 8–10 cm. in diam.); naked canes 2·5–3 cm. in diam.; the internodes cylindraceous short (15–20 cm. long) with a yellow straw-coloured and polished surface. *Leaf-sheaths* thick woody, not flagelliferous, reddish-brown when dry, those of the upper part of the plant short, strongly gibbous above, more than armed, may be described as ornamented with very numerous sinuous, interrupted, approximate, deflexed, minute, narrow crests which are comb-like fringed with very many small capillary ultimately deciduous spiculae, very obliquely truncate at the mouth and with very densely and shortly hispid margins. *Ocrea* indistinct. *Leaves* very large, the upper ones cirriferous; petiole very robust, up to 5 cm. broad at its base, channelled above, round beneath, armed at the sides with short straight robust prickles and at the base on the back with small spiculiferous crests as on the sheaths; rachis in its first portion round beneath, slightly channelled and with two acute spinulous angles above and broad side faces, where are inserted the leaflets; higher up in the upper surface the spinulous angles become always more approximate and finally the side-faces unite into a acute salient angle; beneath it is at first round and upwards obsoletely angular and strongly armed with extraordinarily robust digitate claws; the cirrus is very robust and bears at distances of 3–5 cm. $\frac{3}{4}$-whorls of very stout, broad-based black-tipped claws; leaflets very numerous, equidistant, alternate or sub-opposite, 4–6 cm. apart, elongate-ensiform, acuminate, 50–70 cm. long, 2·5–3·5 cm. broad, subconcolorous on both surfaces, 3-costulate, with the mid-costa rather strong, naked or sparingly bristly above, while the side costae which are slender are more or less furnished with long bristles; below the mid-costa is furnished with long bristles and the side costae are very slender, naked or furnished with bristles, smaller than above; transverse veinlets inconspicuous; margins slightly thickened by a secondary nerve and rather distantly bristly-ciliate. *Male spadix* large, shorter than the leaves, in one specimen 1·25 m. long, panicled, rather dense, with not very numerous approximate partial inflorescences; primary spathes rather short, 8–10 cm. long in the exposed part, tubular, slightly enlarged above, closely sheathing, the lower ones slightly compressed, the upper ones more cylindraceous, thinly coriaceous, often longitudinally split but not lacerated, more or less sparsely armed (especially on the back) with short small solitary or confluent prickles, obliquely truncate, entire and naked at the mouth and prolonged at one side into a dorsally keeled triangular acute point; partial inflorescences inserted at the bottom of their own spathe with a long pedicelliform part; the lower ones, the largest, up to 80 cm. long with 7-8 gradually diminishing secondary inflorescences on each side: secondary spathes tubular-cylindraceous, slightly infundibuliform, unarmed, almost horizontally truncate, shortly apiculate at one side, glabrous, thinly coriaceous, entire or longitudinally split but not lacerated; secondary inflorescences ascendent, stalked and inserted inside their own spathe; the lower ones, the largest, 15–20 cm. long with 15–20 spikelets on each side; tertiary spathes tubular-infundibuliform, acute at one side; spikelets inserted at the bottom of their own spathe, with a distinct flattened pedicel; the lower ones, the largest, 20–25 mm. long, often arched, with 15–20 very crowded bifarious flowers on each side; spathels very closely packed, concave subcymbiform with a round obtuse or apiculate point; involucre shorter than the spathels, cupular, deep, entire truncate, two-keeled on the side next to the axis. *Male flowers* small, 3 mm. long, obovoid, rather obtuse, furfuraceous at the summit like the spathels; the calyx campanulate, slightly narrowed to the base, finely inconspicuously striately veined, divided down almost to the middle into 3 broad and at the summit rounded lobes; the segments of the corolla one-third longer than the calyx, concave, lanceolate, externally opaque. *Female spadix* simply decompound, panicled, shorter than the leaves, not flagelliferous at its summit, in one specimen about 1 m. long with many approximate partial inflorescences; primary spathes as in the male spadix, but much more densely armed with short subseriate reversed prickles, the lower ones slightly differing from the others; partial inflorescences stalked as in the male spadix, the lower ones, the largest, 50–60 cm. long with 8–11 distichous spikelets on each side; secondary spathes as in the male spadix, but sometimes very sparingly prickly, ultimately decayed in their upper part, but not lacerated; spikelets attached to the bottom of their own spathe and stalked, spreading, slightly arched, the lower ones, the largest, 10–15 cm. long, the upper ones somewhat shorter; spathels shortly infundibuliform, horizontally truncate and entire at the mouth, obtuse and not or very slightly prolonged on the exterior side; involucrophorum calyciform, inserted at the bottom of its own spathel, narrowed to the base and therefore subpedicellate, acutely two-keeled on the side next to the axis; involucre cupular, exceeding the involucrophorum, irregularly cupular and unilaterally evolute; areola of the neuter flower elliptic, concave, sharply bordered. *Female flowers* about 6 mm. long, the calyx dusty-furfuraceous, divided into 3 ovate lobes; the segments of the corolla ovate-lanceolate, acute externally, opaque, finely striate and about as long as the calyx; filaments of the stamens very broad, connate by their base, very suddenly apiculate; abortive anthers small. ***Fruiting perianth*** not forming a pedicel and split under the fruit. ***Fruit*** ovoid-elliptic or slightly obovoid, conically beaked and acute at the apex, about 18 mm. long and

10–11 mm. broad (when quite ripe); scales in 15 series, shining, somewhat convex, not channelled along the middle, brownish-straw-coloured with a darker semicircular transverse band at the base of the point; this elongate triangular, opaque, scarious, reddish-brown, finely erosely fringed. *Seed* ovoid, rounded at both ends, convex, coarsely and sinuously grooved on the back, flattish on the raphal side, with a circular and very superficial chalazal fovea; albumen equable; embryo basal.

The different parts of the spadix, the spikelets and flowers and even the leaflets have a cinnamon-brown colour when dry.

HABITAT.—Common in the forests of the Andaman and Nicobar Islands. Kurz gives the Andamanese name of "Chowdah" and Man that of "Chârab" in the Andamans and "Nât" in the Nicobars. The radical (not cirriferous) leaves are employed, according to Man, for thatching, and then the plant receives the name of "Hok-Nēak."

OBSERVATIONS.—This is the *Calamus* with the largest stem of those known to me; it approaches in many characters to *C. ovoideus*, but it is easily distinguishable by the fruit-scales which have a very conspicuous elongate and scarious point. In the not fully-grown fruit only the brown and dull points of the scales are visible and their yellow posticous glossy part remains covered. In my enumeration of the species of *Calamus* (Records of the Bot. Surv. of India, ii, 211), I have mentioned a var. *nicobaricus*, having found remarkable differences in the armature of the leaf-sheaths between my specimen and Kurz's plate xxviii; but apparently this plate represents the base of the stem of a young plant where, besides the small seriate spiculae, there are also longer and larger pectinate spines; while in my specimen of the upper part of a fertile plant, represented in plate 164, this last kind of spine is wanting. The radical leaves and those of the lower part of the plant are not cirriferous.

PLATE 163.—Calamus andamanicus *Kurz.* Partial inflorescence (on the left side) with almost mature fruit (specimen from the Andamans forwarded by Mr. Man with the name of "Chârab"); portion of a leaf from above its middle (under surface) belonging to the specimen mentioned above; male partial inflorescence (from the Nicobars forwarded by Mr. Man with the name of "Nât"); portion of the naked stem, also from the Nicobars by Mr. Man with the name of "Nât"; fruits and seeds from the inflorescence mentioned above.

PLATE 164.—Calamus andamanicus *Kurz.* Summit of a fruit spadix (specimen from the Nicobars collected by Mr. Man); portion of a leaf (upper surface) from near its base, specimen from the Nicobars, forwarded by Mr. Man with the name of "Ok-hēak"; portion of the sheathed stem from a very robust and adult plant; these were also sent from the Nicobars by Mr. Man with the name of "Chârab".

139. CALAMUS ZOLLINGERII Becc. in Rec. Bot. Surv. Ind. ii, 199.

DESCRIPTION.—Scandent, very large and robust. *Sheathed stem* as thick as a man's arm. *Leaf-sheaths* (not flagelliferous ?) almost woody, strongly armed with stout flat, very unequal, light-based brown-tipped, very short or 5–6 cm. long, solitary or irregularly obliquely seriate spines. *Leaves* very large, cirriferous (the one I measured 4·5 m. in the pinniferous portion); the cirrus very robust, armed with $\frac{3}{4}$-whorls of very strong black claws; petiole very robust, 3–3·5 cm. broad, deeply channelled above, round beneath where irregularly armed with straight strong unequal spines; rachis in its lowest portion broadly channelled above, rounded beneath, where armed along the middle with solitary claws and elsewhere with scattered prickles; higher up sub-4-angular in section but roundish beneath, and more or less channelled above, with spinulous margins, and with rather broad side-faces where are inserted the leaflets; in the terminal portion trigonous, bifaced above and strongly armed beneath with robust 3–5-fid half-whorled claws; leaflets numerous, equidistant, 3–4 cm. apart, papyraceous, rather rigid, large, ensiform, the largest, the intermediate ones, 50–70 cm. long, 3–3·5 cm. broad, the upper ones smaller and more distant, gradually acuminate at the apex, suddenly contracted and plicate at the base, green on both surfaces; the mid-costa prominent, acute and naked or nearly so above where accompanied on each side by a slender nerve, this furnished with a few long bristles; in the lower surface the mid-costa barely prominent, but furnished with a few 2–2·5 cm. long bristles; the side-nerves faint and smooth; margins remotely spinulous-setose, somewhat thickened by an intramarginal nerve. *Male spadix* not seen entire, but apparently large and much branched; partial inflorescences (only one seen) panicled, compact, cupressiform, divided in its lower part into many approximate secondary branches or compound spikes and bearing upwards some simple spikelets; these much larger than the secondary ones of the lower branchlets; primary spathes not seen; secondary spathes tubular-infundibuliform, 2–4 cm. long, closely sheathing, papyraceous, obliquely truncate at the mouth, unarmed, prolonged at one side into a triangular acute point; the lowest compound spikes, the largest, 7–8 cm. long, inserted inside and at the bottom of their respective spathe, 7–8 cm. long; spikelets 6–7 on each side of the secondary axis, approximate, about 1 cm. in length; spathes of the compound spikes broadly infundibuliform, truncate, finely striately-veined, extended at one side into a short triangular point; spathels of the simple spikelets very closely packed, bracteiform or boat-shaped, finely striately-veined, very obtuse; involucre cupular, apparently formed by two bracts, more or less connate by their bases, or sometimes nearly disjunct and ovate, acute, concave, acutely keeled next to the axis. *Male flowers* (in bud) oblong obtuse, 4 mm. long, the calyx entirely split into 3 oblong thinly pergamentaceous, finely striately-veined, concave, rather obtuse parts; corolla twice as long as the calyx, divided down to a little beyond midway into 3 ovate-elliptic, finely striate segments; filaments of the stamens subulate, inflected at the apex, united at the base with the undivided tubular-infundibuliform part of the corolla, longer than the segments; anthers linear sagittate acute; rudimentary ovary formed by 3 small distinct acicular bodies, about as long as the tube of the corolla. *Female spadix* very large but relatively short (1–1·5 m.) non-flagelliferous at its summit and forming a rather dense pyramidate cupressiform panicle, composed of many approximate partial inflorescences; these 30–50 cm. long, terminated by a very short tail-like appendix and bearing 8–14 spikelets on each side; primary spathes relatively short, 10–20 cm. long, tubular-cylindraceous slightly enlarged above, closely sheathing, more or less covered with scattered tuberculiform spines and prolonged at the summit into a withered triangular acuminate point; secondary spathes as in the male spadix, often longitudinally split in the fruiting stage; spikelets inserted inside their own spathe and conspicuously pedicellate, ascendent at first, then spreading, the lowermost 8–10 cm. long with 15–20 distichous flowers on each side; spathels very short and closely packed, broadly infundibuliform, truncate, extended at one side into a very short point, the margin entire, ciliately furfuraceous when young; involucrophorum unilaterally subinfundibuliform, narrowed to the base and therefore distinctly pedicellate, not exceeding its own spathel and attached to its bottom, sharply and acutely two-keeled on the side next to the axis; involucre cupular, rather deep, truncate, deeply excavate and 2-toothed on the side of the neuter flower, of which the areola is rather deep, lunate but often somewhat vertically evolute and sharply bordered. *Female flowers* conical-ovoid, 4 mm. long; the calyx with 3 short small triangular acute teeth; the corolla pergamentaceous, barely longer than the calyx, divided down to about midway into 3 lanceolate acute lobes; stamens forming with the united bases of the filaments an urceolate cup as high as the $\frac{2}{3}$ of the corolla and crowned with 6 short triangular acute teeth; anthers short, very broadly sagittate, with acute tip and auricles; ovary turbinate, surmounted by a trigonous columnar style of about the same length; the stigmas elongate, acute, recurved, projecting from the connivent perianth. *Neuter flowers* long, permanent, smaller and thinner than the female ones. *Fruiting perianth* explanate, and subtended by the sub-pedicelliform involucrophorum. *Fruit* (immature) small, globose, 6 mm. in diam. and 9 mm. long, including the brown acute apical mucro (this 1·5 mm. long); scales in 18 longitudinal series, shining, pale-yellow, superficially channelled along the middle with a very narrow brown intramarginal line, the margin scarious and minutely erose, the point dark-coloured, short hairy-fimbriate when seen under a lens.

HABITAT.—Celebes: in the littoral jungle at Boni, collected by Zollinger in November 1847 (Zoll. No. 3433) in Herb. Boiss. and Herb. Bruxelles. From North Celebes I have seen a specimen in Herb. Berlin collected by Warburg at Bojong in the province of Minahassa.

OBSERVATIONS.—A note of Zollinger appended to the distributed specimens declares this to be a very large and scandent species about 20 m. high. A fine specimen from a plant said to be from Menado in North Celebes, cultivated in the Botanical Garden at Buitenzorg, No. 3920, and forwarded to me by Dr. Treub, proves the huge dimensions of this species. I have no doubt that this specimen belongs to the same species as Zollinger's No. 3433, but probably the cultivated plant has acquired larger dimensions than the wild ones. On the Buitenzorg specimens I have based the description of the vegetative organs; the male spadix has been described from Zollinger's No. 3433 preserved in Martius' Herbarium at Bruxelles, and the female one from another specimen, also of Zollinger, with the same number and apparently of the same gathering in Boissier's Herbarium. I have added some general characters from the spadix of the above-mentioned cultivated plant.

I have received from the Leyden Herbarium a portion of a fruiting spadix with perfectly ripe fruit, which portion was intermingled with specimens of *C. Burckianus* and had the label "Rotang Mapait, Celebes. De Vriese." This specimen in fruit, I have little or no doubt, belongs to *C. Zollingerii* with which it agrees perfectly in the shape and size of the pedunculate spikelets, as well as in the spathes, spathels, involucres and fruiting perianth. The fruit (which indeed is very similar to that of *C. Burckianus*) is globose, 1 cm. in diam.; shortly and very abruptly mucronate;

the scales are in 20 series, pale greenish-brown, faintly channelled along the middle, not bordered by a darker line; their margins finely erose, the tip dark and seemingly once finely fimbriate. The seed is distinctly and sharply dimidiate, convex and nearly smooth on the back, flattish on the raphal side, and with the chalazal fovea forming a very deep, narrow conical groove, filled with a very dark matter and nearly passing through the entire equable albumen; the embryo is basal.

This remarkable species of the group with pedunculate spikelets inserted to the very bottom of their respective spathe is distinguishable by its very robust stem; the petiole not spinulous above, the leaflets very numerous, equidistant, very elongate-ensiform, very acuminate, with the mid-costa naked and two side-nerves bristly above, and the mid-costa bristly beneath and the side-nerves naked; the spadices large, pyramidate, rather dense; the fruit small globose mucronate; the scales superficially channelled with a short point, the seed with a smooth surface and equable albumen.

On the label of Zollinger's No. 3433 in the Herbarium at Bruxelles, Martius has written: "*Calamus*, horti Bogoriensis in Java," from which it follows that apparently Zollinger made the specimens of this species on plants cultivated in the Botanic garden at Buitenzorg— a circumstance which will account for the mixtures which have occurred with specimens of *C. Burckianus*, a Javan species.

PLATE 165.—Calamus Zollingerii *Becc.* Upper portion of a leaf-sheath with the base of the petiole; two leaflets (under surface) with portion of the rachis from about the middle of the leaf; the summit of a leaf with its terminal cirrus; partial inflorescence from a female spadix with ovaries in course of development; two female spikelets; one primary spathe.—From the specimen cultivated at Buitenzorg as mentioned above.

PLATE 166.—Calamus Zollingerii *Becc.* Male partial inflorescence (in the lower left-hand corner) and summit of a partial inflorescence with very young fruit (in the lower right corner)—both from Zollinger's No 3433 in Martius' Herbarium at Bruxelles; partial female inflorescence in flower (on the upper right side) from Zollinger's No. 3433 in Herb. Barbey-Boissier; portion of a female inflorescence with mature fruit from the Leiden Herbarium; seed, central and dorsal side; seed longitudinally cut across the embryo.

140. CALAMUS MERRILLII Becc. sp. n.

C. maximus (not of Blanco) Becc. in Perkins, Fragm. Fl. Philipp. i, 45.

DESCRIPTION.—Very large, and high scandent. *Sheathed stem* 6–7 cm. in diam. *Leaf-sheaths* thick, woody, reddish-brown; those of the upper part of the plant transversely puckered or gibbous at the base of the petiole, armed with very numerous small spiculae or rigid and very brittle bristles, 5–10 mm. long, of which a few are very often confluent and form by their united bulbous bases short, interrupted, thick and in their upper part swollen series. *Ocrea* short (or deciduous ?) represented by a brown exsuccous bristly-hispid rim on the mouth of the sheaths. *Leaves* very large, the upper ones cirriferous; petiole very robust, as much as 3·5–4 cm. broad (in one leaf 25 cm. long), polished, naked at the base and beneath, and like the first portion of the rachis shallowly and broadly channelled above, armed at the margins with numerous very short straight erect conic prickles; rachis in its first portion round beneath, slightly channelled and with two acute spinulous angles above and broad side-faces, where are inserted the leaflets; higher up the spinulous angles are always more approximate and finally they become united into a single acute remotely spinulous salient angle; beneath, it is at first round and upwards obsoletely angular and strongly armed with extraordinarily robust digitate claws; the cirrus very robust and bearing at distances of 3–5 cm., $\frac{3}{4}$-whorls of very stout broad-based black-tipped claws; leaflets very numerous, equidistant, approximate, 15–20 mm. apart in the basal and intermediate portion, more distant towards the summit, elongate-ensiform, shortly narrowed to and deeply plicate at the base, gradually acuminate from not very far above the base into a subulate apex, 40–45 cm. long (the upper ones shorter) 25–27 mm. broad, papyraceous, opaque and concolorous on both surfaces when full-grown, apparently slightly mealy-white beneath when young, more or less distinctly tricostulate, with the mid-costa rather strong, naked or sparingly bristly only near the summit; the side costae slender and more or less furnished with long bristles above; below the mid-costa furnished with long bristles and the side costae very slender and naked; transverse veinlets inconspicuous; margins thickened by a rather distinct marginant nerve and minutely, rather spreadingly and rather closely spinulous. *Male spadix* large, broadly panicled-pyramidate, shorter than the leaves, about 1·2 m. long with an erect rigid axis, and with about 5 distichous approximate gradually diminishing partial inflorescences on each side, not flagelliferous at its apex and terminating in an unarmed sheathed tail-like appendix; primary spathes rather short, 10–12 cm. long in the exposed part, tubular, closely sheathing, the lowest flattened, slightly longer, the others armed with short scattered prickles on the back and with a few long spines at its base on the not very sharp edges; upper primary spathes sub-cylindraceous, slightly enlarged above, thinly coriaceous, often longitudinally split but not lacerated, more or less sprinkled with small solitary, scattered, short, semi-conic prickles, entire and naked at the mouth and prolonged at one side into a triangular acuminate point; partial inflorescences inserted at the bottom of their own spathe with a long pedicelliform part, rather dense, pyramidate; the lower ones, the largest, 35–40 cm. long with 6–7 gradually decreasing secondary inflorescences or spicigerous branchlets and terminating in a short unarmed sheathed appendix; secondary spathes tubular-cylindraceous, slightly infundibuliform, about 3 cm. long in the exposed part, almost horizontally truncate and naked at the mouth, shortly apiculate at one side, glabrous, thinly coriaceous, entire or sometimes longitudinally split but not lacerated; secondary inflorescences ascendent, stalked and inserted inside at the base of their respective spathes; the lower ones, the largest, 14–15 cm. long with 13–15 erecto-patent pinnate spikelets on each side; tertiary spathes (spathes of the branchlets) shortly infundibuliform, horizontally truncate, entire and naked at the mouth, shortly apiculate at one side; spikelets also inserted inside at the bottom of their own spathe with a distinct flattened pedicel, the lower ones, the largest, about 25 mm. long, very brittle, with 11–12 very approximate, flatly bifarious flowers on each side; spathels very closely packed, concave-subcymbiform, with a round usually obtuse point; involucre shorter than the spathels, cupular, deeply bidentate, two-keeled and with the margin lunately excavate on the side next to the axis. *Male flowers* . . . . . *Female spadix* . . . . .

HABITAT.—The Philippines at Bosoboso, prov. of Rizal in Luzon, (*Merrill.* No. 1893 in Herb. Berol., collected April 1903: specimens with male spadices but without a single flower left upon them). I consider also as very probably belonging to *C. Merrillii*, Loher's No. 1361 in Herb. Kew, collected in Central Luzon and consisting only of a partial inflorescence with mature fruit.

OBSERVATIONS.—*C. Merrillii* seems very closely related to *C. Zollingerii*, and the leaves and the male spadix of the two are hardly distinguishable. *C. Zollingerii*, however, has the leaf-sheaths armed with long robust spines, while those of *C. Merrillii* are covered with small more or less confluent spiculae. *C. Merrillii* in the leaves and in the male spadix is also very similar to *C. andamanicus*, and the leaf-sheaths of both are armed with spiculae but these in the first are arranged in short series, while the series are long and continuous in the second. The fruit of *C. Merrillii* is, however, very probably quite different from that of *C. andamanicus*, while it seems similar to that of *C. Zollingerii*; and indeed I consider as belonging to *C. Merrillii* a partial inflorescence of a fruiting spadix of a *Calamus* collected by Loher in Central Luzon (No. 1361 in Herb. Kew.), and the reason of this belief of mine rests on the great resemblance of this fruit spadix to that of *C. Zollingerii*, while in the male spadix and in the leaves of both species this resemblance is so great that it is hardly possible to discover any appreciable difference. The following is the description of Loher's specimen: *Partial inflorescence* 42 cm. long with 11 spikelets on each side and terminating in a very short unarmed tail-like appendix; secondary spathes infundibuliform, short, truncate, smooth or occasionally with a very small prickle here and there; spikelets thick with a distinct pedicellary part arising from the bottom of their respective spathe; spathels very approximate, very shortly and broadly infundibuliform; involucrophorum unilaterally subinfundibuliform inserted to the bottom of its own spathel, two-keeled and with the margin excavate on the side next to the axis; involucre cupular, truncate; areola of the neuter flower very distinct, sharply bordered. *Fruiting perianth* split down to the base into 6 almost equal parts and subtended by the subpedicelliform involucrophorum. *Fruit* sphaeric, obtusely mucronate-mammillate, 11–12 mm. in diam.; scales in 21 series narrowly channelled along the middle, light greenish-brown with a narrow paler margin and an obtuse inconspicuously fringed brown tip. *Seed* with even surface, convex on the back, slightly flattened on the raphal side without a distinct chalazal fovea; albumen equable bony; embryo basal, slightly on one side.

PLATE 167.—Calamus Merrillii *Becc.* Leaf-sheath; portion of a leaf (upper surface) not very far above its base; portion of a male spadix (the above from Merrill's No. 1893 in the Herb. at Berlin. Spikelet with mature fruit; seed from dorsal and raphal side; one seed longitudinally cut through the embryo in two halves; from Loher's No. 1361 in Herb. Kew.

141. CALAMUS AQUATILIS Ridley in Journ. Roy. As. Soc. Straits Branch, No. 41 (1903), 43.

DESCRIPTION.—Scandent and of moderate size. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* cirriferous, large, about 2 m. long in the pinniferous portion, the cirrus about one m. long, powerfully armed with $\frac{3}{4}$-whorls of 6 very acute very highly connate black-tipped claws; petiole . . . . .; rachis in its first portion flattish and rather strongly prickly above with rather broad side-faces where are inserted the leaflets, smooth and bifaced upwards, in the lower surface roundish, naked near the base, then armed with solitary remote rather strong and higher up geminate or ternate, rather strong and finally where passing into the cirrus, half-whorled claws; leaflets very numerous, equidistant, 2·5–4 cm. apart, the largest, those a little above the base, 30–33 cm. long, 18 mm. broad, the upper ones gradually shorter but not narrower (except those near the base of the cirrus), narrowly ensiform, somewhat narrowed at the base where strongly plicate and not callous at the axilla, inserted at an angle of about 45°, gradually acuminate into a subulate very slender and at the sides bristly-spinulous filamentous tip, papyraceous, rigidulous, brown when dry, rather opaque in the upper surface, where the mid-costa is very slender, barely raised and naked and the side nerves are excessively slender and numerous so as to give to that surface a finely striate appearance; the lower surface is distinctly paler than the upper one, sprinkled with very small rusty scales and furnished with small bristly spinules along the very superficial mid-costa and on one and sometimes two nerves on each side of this. *Male spadix* large supradecompound (not seen entire by me); primary spathes rather short (8–10 cm. long) tubular, subcylindraceous slightly enlarged above, very closely sheathing, concave at the base on the inner side and with acute margins there, truncate and entire at the mouth where prolonged at one side into an elongate triangular dorsally keeled point, rather densely armed in their upper part with small black-tipped reversed spines which are simple, or more often 3-fid or subpectinate; partial inflorescences rather large, loosely paniculate, 40–50 cm. long, broad at the base and gradually narrowing towards the summit where they terminate in a very short unarmed caudiculum with 7–8 branchlets or compound spikes near their base and 3–4 simple spikelets upward on each side; secondary spathes tubular, cylindraceous, barely larger in their upper part, closely sheathing, entire, unarmed, truncate at the mouth, prolonged at one side into a triangular elongate point; the branchlets attached inside to the bottom of their respective spathe with a distinct slender pedicel, the lower ones the largest, 13–15 cm. long, somewhat flexuose with numerous (even 20) spikelets on each side; tertiary spathes infundibuliform truncate; spikelets very short (10–15 mm. long) attached inside to the bottom of their respective spathes with a distinct pedicellar part, complanate, with 8–10 very closely set and perfectly flatly bifarious flowers on each side; spathels bracteiform very closely packed, broad, concave, strongly striately veined, acute at one side; involucre dimidiately cupular like a swallow's nest, obliquely truncate, acutely bidentate and acutely keeled with the margin deeply excavate on the side next to the axis. *Male flowers* subtended by the spathels with the calyx strongly striately veined. *Female spadix* broadly panicled, simply decompound, with numerous distichous partial inflorescences, which are inserted with a peduncular part inside to the bottom of their respective spathe and arise erect from this and then spreading, the lower ones the largest, about 40 cm. long, with 8–10 spikelets on each side; secondary spathes as in the male spadix; spikelets arising erect from their own spathe, to the bottom of which they are inserted with a flattened pedicel, 8–10 cm. long with 18–20 flowers on each side; spathels infundibuliform truncate at the mouth and prolonged at one side into a rather long point; involucrophorum calyciform, narrowed at the base and inserted at the bottom of its own spathel, acutely bidentate and two-keeled on the side next to the axis; involucrum unilaterally evolute, deep cupular-auriculiform; areola of the neuter flower ovate-lanceolate in outline, very distinct. *Female flowers* 3–3·5 mm. long. *Fruiting perianth* explanate (not pedicelliform); the calyx finely striately veined divided into 3 broad, ovate, suddenly apiculate lobes; the segments of the corolla broadly lanceolate, acuminate, as long as the calyx and also striately veined. *Fruit* globose, small, about 1 cm. in diam.; scales in 12 series, shining, yellowish-brown, narrowly channelled along the middle with a rather dark narrow marginal and towards the rather obtuse tip broadening line, the margin finely ciliate-fringed. *Seed* orbicular, convex and deeply pitted on the back, concave on the raphal side, 7 mm. broad, its surface when dry densely hairy-velvety, being covered with numerous elongate filamentose adherent cellules belonging to the integument, of which the fleshy part has been destroyed; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula at Batu Pahat in the State of Johore (*H. N. Ridley*, Nov. 1900, No. 11126 in Herb. Becc. and No. 11216 in Herb. Kew); at Singapore, Ponggol Rd. *Ridley* (No. 11304). Ridley l.c. indicates also the localities of Serangoon Rd. and Changi (No. 6275) in Singapore; of Sungei (River) Tebrau, and of Kuala Pakang in Pahang. Malay name "Rotang Bakau" (Ridley).

OBSERVATIONS.—Evidently related to *C. Zollingerii*, *ovoideus* and *andamanicus*, but entirely distinct from all.

Amongst the species of *Calamus* of which the fruit is known to me, this only has a seed with a velvety surface, apparently produced by the partial destruction of the integument which is probably fleshy when fresh and afterwards leaves the more persistent cells of its tissue adherent to the testa of the seed. It is furthermore distinguished from the other species of the group by the leaves with numerous equidistant ensiform unicostate leaflets, which are smooth in the upper surface and are finely bristly-spinulous on 3 and even 5 nerves beneath and furthermore sprinkled there with very small rusty scales, and by the small globose fruit with the scales finely ciliate-fringed at the margin.

PLATE 168.—Calamus aquatilis *Ridley*. The summit of a leaf; an entire partial inflorescence from a male spadix.—Ridley's specimen in Herb. Becc.

PLATE 169.—Calamus aquatilis *Ridley*. Portion of a leaf, upper surface, not very far above its base; two portions of the fruit-spadix; detached mature fruit; seeds from dorsal and raphal side, one longitudinally cut through the embryo.—From Ridley's specimen in Herb. Becc.

142. CALAMUS WARBURGII K. Schum. in Schum. und Laut. Fl. deutschen Schutz. in der Südsee, 203.

DESCRIPTION.—Scandent, rather robust. *Leaf-sheaths* (in the small portion of one specimen seen by me) fugaciously grey-furfuraceous, unarmed on the back and at the sides and furnished on the ventral side of its upper part with weak, crowded, horizontal, brownish or greyish furfuraceous, laminar, pectinate spines, which are confluent by their base, subulate in their free portion, and 1 cm. long at most. *Ocrea* inconspicuous. *Leaves* very large, about 1·5 m. long in the pinniferous part, terminating in a long (1 metre and more) robust cirrus; this strongly armed with not very large black-tipped highly connate claws; these usually are grouped in numbers of six and form many very regularly arranged half-whorls, which are 3 cm. apart at first and gradually more approximate the nearer the summit, where they are almost in contact one with the other; petiole almost obsolete (15 mm. long); rachis in its basal portion 14–15 mm. broad, flattish and naked above with its margin finely and acutely spinulous-serrate, slightly furrowed at the sides where are inserted the leaflets; higher up the rachis is flattish, also beneath and in section almost rectangular, towards the summit is acutely bifaced above, and roundish beneath where at first armed with solitary and nearer the cirrus with 3–6 half-whorled claws; leaflets very numerous, pectinate or very regularly and very closely (15 mm. apart) set, the lower ones almost horizontal; the upper ones inserted at an angle of about 45°, all except those nearer the petiole, wihch are narrower and shorter, about of the same size, 20–26 cm. long, 18–22 mm. broad, very narrowly lanceolate, slightly narrowed to the base, where suddenly plicate without an axillary callus at their insertion, gradually acuminate into a slender laterally bristly-spinulous tip, glabrous, subshining above, barely paler beneath, papyraceous, rigidulous, 3-costulate, the mid-costa acute and scarcely spinulous above; the side-costae very slender, with a few brown bristles, chiefly nearer the summit; beneath the costae are slender, and that of the centre has more and longer bristles than the side ones; transverse veinlets slender, much interrupted and anastomosing; the margins, especially the lower one, somewhat thickened by a nerve, finely and adpressedly spinulous. *Male spadix* . . . . . *Female spadix* rather large (not seen entire by me) with a rigid and straight axis and numerous distichous rather approximate partial inflorescences; primary spathes short, almost all of equal size and shape, the larger ones, the lowest, 7–8 cm. long, papyraceous, brown, exsuccous, marcescent, tubular, somewhat flattened, almost horizontally truncate and entire at the mouth, prolonged at one side into a short triangular acute point, unarmed or slightly tubercled-spinulous; the peduncular part of the spadix stout, 2 cm. broad, quite flat on the inner side, convex and densely tubercled-spinulous on the back; partial inflorescences arising erect from their respective spathe and then more or less spreading, inserted inside to the bottom of their respective spathe through a long flattened pedicel, 30–45 cm. long, with 10–12 spikelets on each side; secondary spathels tubular-infundibuliform, unarmed, polished, exsuccous and decayed in their upper part, which remains obviously distinct from the living one, more or less obliquely truncate, entire and naked at the mouth, prolonged at one side into a short broad triangular point; spikelets somewhat flattened, erecto-patent, inserted inside to the bottom of their respective spathe through a slender flattened pedicel; the larger ones, the lowest, 6–7 cm. long, with about 20 flowers on each side; spathels broadly asymmetrically infundibuliform, striately veined outside, horizontally truncate and naked at the mouth, apiculate at one side; involucrophorum inserted at the bottom of its own spathel, dimidiately infundibuliform, rather deep, somewhat narrowed to the base, flat, bidentate, acutely keeled and with the margin excavate on the side next to the axis; involucre deep subcupular, entire, asymmetrically evolute on the side of the neuter flower and subauriculiform; areola of the neuter flower conspicuous, ovate, sharply bordered. *Female flowers* very small, about 3 mm. long. *Fruiting perianth* explanate (not pedicelliform); the calyx split into 3 broad striately veined lobes; the segments of the corolla very finely striate, acute, narrower than the lobes of the calyx and as long as this. *Fruit* small, ellipsoid-ovate (when nearly ripe), very suddenly apiculate, about 1 cm. long, 6·5–7 mm. broad; scales in 18 series, pale, very convex, rather deeply channelled along the middle, with very narrow scarious erosely toothed margin. *Seed* (immature) globular, apparently with smooth surface and a deep chalazal fovea; albumen equable; embryo basal.

HABITAT.—German New Guinea: Kaiser Wilhelmsland, on the Schumann River at 780 m. elevation, *Kersting* No. 437, in Herb. Berol.

OBSERVATIONS.—This is in all respects a very distinct species from the large, almost epetiolate leaves with very numerous, very approximate, pectinate, rigid, subhorizontal narrowly lanceolate 3-costulate leaflets, which have the 3 costae bristly on both surfaces and the margins adpressedly and closely spinulous; fruit small, ellipsoid-ovoid apiculate, scales with finely erosely toothed margin.

PLATE 170.—Calamus Warburgii *K. Schum.* Basal portion of a leaf (under surface); intermediate portion of a leaf (upper surface); the summit of a leaf (under surface); basal portion of a fruit spadix.—From Kersting's No. 437 in Herb. Berol.

143. CALAMUS MOSELEYANUS Becc. in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—Probably scandent and of moderate size. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* not seen entire by me, but apparently rather large and cirriferous; petiole . . . . . ; rachis of the intermediate portion glabrous, trigonous, bifaced above with the upper salient angle obtuse and smooth, subtetragonous near its summit where it passes into the flagellum; in the lower surface almost polished and armed along the middle with robust, black-tipped claws; these at first solitary, then 3–5-nate and closely half-whorled on the cirrus; leaflets not very numerous, not aggregate, subequidistant, 7–10 cm. apart on each side, alternate or subopposite, 25–32 cm. long, 3–4·5 cm. broad, lanceolate or narrowly elliptic-lanceolate, almost equally narrowed to both ends, bristly-penicillate at the apex, papyraceous, rigidulous, glabrous, subconcolorous on both surfaces, flat (not plano-convex) with 5 costae, of which that near the lower margin faint and naked, the other 4 spinulous above; underneath all nerves faint and naked; transverse veinlets rather distinct, very irregular and interrupted; margins acute, not very closely spinulous-ciliate. *Male spadix* supradecompound, rather large and diffuse; primary spathes tubular, closely sheathing, aculeolate in their upper part; partial inflorescences panicled-pyramidate, in 2 specimens 30 cm. long, attached outside the mouth of their respective spathe, with several branchlets (or compound spikelets) in their basal part and several simple spikelets from the middle upwards; secondary spathes elongate tubular-infundibuliform, glabrous, unarmed, obliquely truncate and ciliolate at the mouth and produced at one side into a triangular acute point, the lower ones, the largest, 2–2·5 cm. long; branchlets attached just at the mouth of their respective spathe, the lower ones, the largest, 8–10 cm. long with 8–10 spikelets on each side; upper branchlets shorter and with fewer spikelets; tertiary spathes infundibular, truncate, produced at one side into a triangular acuminate point; spikelets spreading or horizontal, slightly arched, flat and comb-like (when carrying full-grown flowers), attached just at the mouth of the spathes; the lower ones, the largest, 15–25 mm. long, brittle, with 6–15 flatly bifarious horizontal flowers on each side; spathels bracteiform, broad with a triangular deflexed point, this subtending its respective flower; involucre shallowly cupular, slightly bidentate and lunately excavate on the axial side; spikelets of the upper part of the partial inflorescences 2·5–3·5 cm. long with a proportionate number of flowers *Male flowers* oblong-cylindraceous obtuse, 4 mm. long; their calyx cupular with 3 superficial broad teeth; their corolla twice as long as the calyx. *Female spadix* decompound, diffuse, terminating in a small flattened sheathed aculeolate tail-like flagellum, with a few not very remote (10 cm. apart) partial inflorescences; primary spathes (the first not seen by me) elongate-tubular, closely sheathing, slightly enlarged above, and narrowed towards the base, where flat on the inner side, convex on the back and with acute margins, thinly coriaceous, fugaciously scaly-furfuraceous, ultimately glabrous, faintly longitudinally striolate, aculeolate on the back in their upper part, entire, truncate and scarious-ciliolate at the mouth, where suddenly prolonged into a dorsally keeled point; partial inflorescences erecto-patent, inserted above the mouth of their own spathe with a distinct axillary callus and a distinct (nectarifluous?) transverse rima, the lower ones (of the portion of spadix seen by me) 25 m., the uppermost 20 cm. long, with 5–6 distichous spikelets on each side; secondary spathes narrowly tubular-infundibuliform, unarmed, glabrous, striolate, about 2 cm. long, truncate at the mouth and barely prolonged at one side into a broadly triangular point; spikelets erecto-patent, rigid, slightly arched, inserted just at the mouth of their own spathe, slightly callous at their axilla, 4·5–6 cm. long, the lower ones, barely longer than the upper ones, their axis closely zig-zag sinuous with 10–12 distichous flowers on each side; spathels broadly and asymmetrically infundibuliform, narrowed a good deal to the base, obsoletely striately veined, horizontally truncate, entire and ciliolate at the mouth, prolonged at one side into a triangular acute short patent point; involucrophorum shallow, sub-cupular, posticously bidentate, sub-horizontally subtended by its own spathel and laterally attached at the base of the one above; involucre moulded on the involucrophorum and not or slightly exceeding this, shallowly cupular, bidentate and with the margin slightly excavate on the side of the neuter flower; areola of the neuter flower lunate, sharply bordered. *Female flowers* small, about 3 mm. long. *Fruiting perianth* shortly cylindraceous, distinctly pedicelliform, with 3 very broadly triangular lobes, not or obsoletely striately veined; the segments of the corolla as long as the lobes of the calyx but narrower; the filaments of the stamens forming by their connate bases an urceolum one-half as long as the corolla and crowned by 6 broad, short, triangular teeth. *Fruit* globose, small, 8–9 mm. in diam., topped by a small mucro; scales squarrose or loosely imbricate and not adpressed, large relatively to the size of the fruit and few, in 12 series, broadly and superficially channelled along the middle, shining, yellowish-brown with a paler scarious finely erosely toothed margin and often with a reddish-brown spot at the apex; this triangular and rather acute. *Seed* small, subglobose, 5 mm. in diam., deeply and broadly pitted on the back; albumen subruminate; embryo basal.

HABITAT.—Lower Philippines: in the Island of Malanipa, discovered in 1875 by Mr. H. W. Moseley during the expedition of the Challenger (female specimen in Herb. Kew); in Mindanao at San Ramon, district of Zamboanga, *H. Hallier* Febr. 1904, male specimen in Herb. Manilla.

OBSERVATIONS.—The species is founded on Mr. Moseley's specimen which is only the intermediate portion of a leaf and upper part of a fruiting spadix, 40 cm. in length, with 4 partial inflorescences. The description of the male spadix has been written from Hallier's specimen which I have considered as conspecific with the other, because it comes from the same region, does not offer appreciable differences in the leaves from the type and because the male flowers offer the general characters of the other species of the group to which *C. Moseleyanus* belongs. In Hallier's specimen the leaflets are lanceolate-elliptic, acuminate to a densely bristly tip, 6·5–10 cm. apart on each side of the rachis, 38 cm. long, 3·5–4 cm. broad with 5 costulae of which the 2 near each margin evanescent towards the apex and smooth, and the other 3 carrying small black spinules in the upper surface; the rachis is armed beneath with very robust black-tipped digitate claws; the cirrus is long and robust and armed at rather short intervals with half-whorls of almost entirely black claws.

PLATE 171.—Calamus Moseleyanus *Becc.* Intermediate portion of a leaf; the summit of a spadix with mature fruit; detached spikelets and seeds.—From Moseley's type-specimen in Herb. Kew.

144. CALAMUS FORMOSANUS Becc. in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—Very probably scandent, of moderate or rather large size. *Sheathed stem* 3–3·5 cm. in diam. *Leaf-sheaths* light coloured (when dry) strongly gibbous and unarmed above, otherwise rather densely covered with subulate, flat, laminar spines, which vary from 1–2 cm. in length, have a broad and somewhat concave base underneath and are of the colour of the sheath with a darker point; the mouth is armed with pale spines, slender and longer than the others. *Ocrea* indistinct. *Leaves* cirriferous, more than 1 m. long in the pinniferous part, the cirrus itself measuring about another metre and armed with half-whorls of 3–5 and upwards $\frac{3}{4}$-whorls of 6–7 confluent black-tipped claws; petiole very short, about 2 cm. long, flat above, convex or with an obtuse angle beneath, armed at the sides with a few straight spines; the rachis glabrous, subshining, finely striate, armed also at the sides like the petiole, roundish and almost smooth beneath in its first portion, and armed upwards with at first solitary and then ternate black-tipped claws; in the upper surface it is flattish and densely covered with short straight spines in the first portion, while in the intermediate one is irregularly trigonous in section, bifaced above with the upper salient angle smooth and not very acute; leaflets not very numerous, 18 on each side in one specimen, inequidistant, distinctly geminate or ternate on each side of the rachis; the fascicles alternate or subopposite, often with a solitary leaflet interposed; the leaflets elongate-lanceolate or oblanceolate, narrowed a good deal to the base, subulately acuminate from their upper third part, thinly papyraceous, flat (not plano-convex), rather firm, opaque, subconcolorous, with rather slender and on both surfaces naked costae; transverse veinlets very sharp, approximate, much interrupted; margins rather closely spinulose-serrate; the largest leaflets, those from about the middle, 25–30 cm. long, 3–3·5 cm. broad, the lower and upper ones somewhat smaller. *Male spadix* ultradecompound, diffuse, not flagelliform terminating in a small sheathed aculeolate tail-like appendix; primary spathes (the first not seen) elongate-tubular, closely sheathing, narrowed to the base where flat on the inner and convex on the outer side, with very acute margins, aculeolate on the back in their upper part, truncate, entire and prolonged into a short point at one side at the mouth; partial inflorescences inserted near or a little above the mouth of their own spathe, spreading and somewhat callous in the axilla at their insertion; the lower ones branched or with a few compound spikelets on each side in their lower part, the upper ones 10–12 cm. long, with 5–6 simple spikelets on each side; secondary spathes tubular-infundibuliform, almost polished or indistinctly striately veined, glabrous, unarmed or sometimes sparingly spinulous, obliquely truncate and ciliolate at the mouth and prolonged at one side into a short point; spikelets arched, spreading or slightly recurved, inserted just at the mouth of their own spathe, flattened, 2–3 cm. long and relatively broad, with 8–10 flatly bifarious very approximate flowers on each side, these inserted at an angle of about 45°; spathels bracteiform, concave, broadly ovate, prolonged at one side into an acute point which is longer than the involucrophorum and subtend their respective flowers, striately veined, scaly-ciliolate; involucre dimidiately cupular or like a swallow's nest, very obliquely truncate, shorter than its spathes, laterally attached to the base of the one above, ciliolate flat and acutely two-keeled and acutely bidentate, and lunately excavate on the side next to the axis. *Male flowers* 5–6 mm. long, ovoid-oblong; the calyx membranous, tubular-campanulate, finely striately veined, with 3 triangular acute teeth; the segments of the corolla lanceolate, acute, one-fourth longer than the calyx; filaments of the stamens united at the base, subulate, inflected at the apex in bud; anthers lanceolate-acuminate, the cells deeply disjunct; rudimentary ovary formed by 3 small subulate bodies—a good deal shorter and more slender than the filaments.

HABITAT.—In the northern part of Formosa at Kelung, gathered by *Mr. Richard Oldham* in 1864 (a specimen of only a leaf in Herb. Kew). Furthermore I have considered as belonging to this species a male spadix preserved in the Herb. at Kew and collected by *Swinhoe* also in Formosa. Here also apparently belongs a specimen which I have seen in the Berlin Herbarium of the terminal portion of a young female spadix with spikelets just projecting from the secondary spathes and also collected by *Warburg* at Taipefu in North Formosa in January 1888.

OBSERVATIONS.—The female spadix in the Berlin Herbarium terminates in a short flattened aculeolate tail-like appendix; the primary spathes are elongate-infundbuliform, narrowing a good deal towards the base, rather densely aculeolate in their upper part; the partial inflorescences are inserted at the mouth of their respective spathes; the secondary spathes are tubular-infundibuliform with a straggling prickle on their back above; the spathels are broadly infundibuliform, much narrowed towards the base, finely striately veined; the involucrophorum is not stalked, almost exsert from its own spathel and laterally attached to the base of the one above.

From the foregoing it would appear that I have derived the description of this species from detached specimens of leaves, male and female spadix. I have however little or no doubt that these materials belong to the same species. Nevertheless I consider *C. formosanus* founded on Oldham's leaf-specimen. *C. formosanus* has no very salient characters in the vegetative organs, but its affinities are evidently with the species of the group of *C. palustris.* It appears related also to *C. Moseleyanus*, but this has subequidistant, not grouped leaflets.

PLATE 172.—Calamus formosanus *Becc.* Summit of a male spadix.

PLATE 172A.—Calamus formosanus *Becc.* Lower part of a leaf, with portion of its sheath; an intermediate portion (upper surface) and the cirriferous summit of the same leaf.—Both plates from Swinhoe's specimen in Herb. Kew.

145. CALAMUS RUMPHII Bl. Rumphia iii. 38; Miq. De Palmis Arch. Ind. 29; H. Wendl. in Kerch. Palm. p. 237.

C. Rotang Linn. Sp. Plant. (2nd edit.) 463.

Daemonorops Rumphii Mart. Hist. Nat. Palm. iii, 331; Miq. Fl. Ind. Bat. iii. 103; Walp. Ann. iii. 481 and v. 829; Becc. Malesia i. 88.

Palmijuncus verus angustifolius seu *Rottang Tuni* Rumph. Herb. Amb. v. 105, pl. 54.

DESCRIPTION.—High scandent, naked canes as thick as a man's finger. *Leaf-sheaths* strongly gibbous above, armed with long slender scattered spines. *Leaves* large, about 2·5 m. long and terminating with an equally long strongly clawed flagellum; rachis strongly armed beneath with 3–4-nate claws; leaflets not very numerous, rather remotely equidistant, about 75 cm. long and 3·5–4 cm. broad. narrowly lanceolate, very acuminate, with the mid-costa and one nerve on each side of it bristly beneath; margins conspicuously ciliate. *Male spadix* . . . . , *Female spadix* simply decompound, broadly paniculate, large, about 50 cm. long, flagelliferous, shorter than the leaves, with 3 or 4 partial inflorescences on each side, each of these bearing 3–5 spikelets on each side; primary spathes tubular, spinous; spikelets short, about 3 cm. long, with a few biseriate flowers (3–4 in each series?). *Fruit* globose-oblong, of moderate size, shortly and broadly mucronate. *Seed* convex on the back and with a deep chalazal fovea on the raphal side. (Descr. from Rumph).

HABITAT.—Amboina at the foot of the mountains at Hitu and Laha and near the *Dammara* forest behind the village of Way and along the river Way-Ory in Leytimor. Malay names "Rotang Tuni"; Amboineese name "Ua-Helite." The Rotang was much used in Amboina at the time of Rumph.

OBSERVATIONS.—I consider this to be a true Rotang allied to *C. palustris* on account of its large panicled spadices, which are said to be 4½ feet long, with the fruit the size of a musket bullet, not quite globose, but slightly oblong and narrowed into a short and thick apex, and smaller than that of "Rotang Calappa" (*Daemonorops calapparius*).

146. CALAMUS PALUSTRIS Griff. in Calc. Journ. Nat. Hist. v. 61, and Palms Brit. Ind. 71. pl. CXCIX; Mart. Hist. Nat. Palm iii, 339; Miq. Fl. Ind. Bat. iii. 131; Walp. Ann. iii. 490 and v. 831; Hook. fil. Fl. Brit. Ind. vi. 458; Becc. in Rec. Bot. Surv. Ind. ii. 211.

C. latifolius (not of Roxb.) Kurz in Journ. As. Soc. Bengal, xliii. 2, (1874) 210, pl. XXI A, and For. Fl. Brit. Burma ii. 518 (partly).

DESCRIPTION.—Scandent, of moderate or rather large size. *Sheathed stem* 3–4 cm., the naked canes 2–2·5 cm. in diam. with a polished yellowish-green surface; the internodes about 20 cm. long. *Leaf-sheaths* not flagelliferous, distinctly gibbous above, obliquely truncate at the mouth, light coloured when dry, usually armed with not many but very large, pale, broadly laminar, deflexed, solitary, scattered or subconfluent or even subseriate, 2–3 cm. long, broad-based and underneath concave spines. *Ocrea* (in the leaves of the upper part of the plant) very rudimentary, liguliform. *Leaves* large, those of the upper part of the plant cirriferous; petiole in young vigorous plants rather long, in those of the upper part of the floriferous stems 8–10 cm. long or at times almost obsolete, and, like the first portion of the rachis, more or less spinous at the sides, flat above where smooth or more or less armed with very short erect spines, rounded beneath where smooth or more or less clawed; upwards (the rachis) subcylindraceous or obsoletely angular or subtrigonous, armed with black-tipped claws; these solitary lower down, ternate and half-whorled higher up; cirrus very robust and long, obsoletely angular, powerfully, closely and regularly armed with half-whorls of strong black-tipped claws; leaflets not very numerous, inequidistant, usually approximate by twos or ternate, with long vacant spaces interposed on each side of the rachis, the fascicles being alternate or subopposite, often with a solitary leaflet interposed, firmly papyraceous, more or less broadly lanceolate or elliptic-lanceolate and almost equally narrowed to both ends or even oblanceolate, acute at the bases, acuminate at the summit into a sometimes rather long bristly tip, more or less concavo-convex; glabrous, green and subshining above where striped along the margins, especially on the lower one and occasionally also longitudinally on the blade, with polished brown bands, these corresponding to the exposed part in præfoliation, subconcolorous or paler beneath, 5–7-costulate, the costae acute above, slender beneath and naked on both surfaces or occasionally with a few spinules on the mid-costa above; transverse veinlets rather close together and very minute; margin almost naked or sparsely spinulous lower down, ciliate upwards and rather densely setose at the apex; the largest leaflets, the intermediate, usually 30–40 cm. long and 3–6 cm. broad, but sometimes as much as 50 by 8–10 cm. *Male spadix* ultradecompound at its base, simply decompound upwards, shorter than the leaves, forming a large panicle 1–1·5 m. long with many not very remote partial inflorescences, terminating in a subflagelliform (20–50 cm. long) aculeolate appendix; upper primary spathes tubular-subcylindraceous, slightly enlarged above, closely sheathing, more or less armed with recurved prickles, decayed and lacerated at the summit; lower partial inflorescences about 50 cm. long with many branchlets at their base and numerous large spikelets upwards; secondary spathes tubular, elongate-infundibuliform, closely sheathing, narrowed to the base, where flat on the inner side and with very acute margins, more or less prickly, chiefly in their upper part, obliquely truncate at the mouth, where prolonged at one side into a triangular more or less decayed point, the lower ones, the largest, 3–4 cm. long, the upper ones gradually shorter; tertiary spathes shorter and more distinctly infundibuliform than the secondary ones, unarmed, prolonged at one side into an acute point, ciliate-paleaceous at the margin; spikelets patent, inserted at the mouth of their own spathe, not or indistinctly callous at the axilla; those of the apical portion of the inflorescences up to 5–6 cm. long, with 18–20 very crowded bifarious flowers on each side; those of the branchlets 1·5–2·5 cm. long with fewer flowers; spathels very closely packed, subbracteiform, concave, broadly ovate, finely striately veined and sprinkled with brown scales, ciliate-paleaceous at the margin, apiculate at one side, the point subtending the flowers; involucre shorter than its spathel, dimidiately cupular or like a swallow's nest, enclosed in its own spathel and attached at the base of the one above, bidentate, two-keeled and deeply lunately excavate on the side next to the axis. *Male flowers* ovate, about 4 mm. long; the calyx deeply 3-toothed, finely striately veined; the corolla almost twice as long as the calyx, opaque outside, finely striately veined. *Female spadix* simply decompound, shorter than the leaves, not very diffuse; primary spathes coriaceous, tubular, closely sheathing; the first short, flattened; the upper ones cylindraceous, slightly enlarged above, 8–10 cm. long, more or less armed with rather slender scattered horizontal or slightly deflexed straight prickles, prolonged at the mouth into a decayed and often lacerated limb, the dead part sharply defined from the living one; partial inflorescences many, rather approximate, the lower ones, the largest, 40–50 cm. long, terminating in a very short tail-like appendix, spreading, arched, inserted very near but inside the mouth of their own spathe, bearing 6–8 distichous spikelets on each side; secondary spathes elongate-infundibuliform, more or less aculeolate on the back, obliquely truncate at the mouth and prolonged at one side into a short point and often withered and lacerated in the oldest inflorescences; spikelets spreading, slightly arched, inserted at the mouth of their own spathe and not distinctly callus at the axilla; the lower ones, the largest, 8–10 cm. long, with 12–13 distichous flowers on each side; the upper ones slightly shorter; spathels short infundibular-cyathiform, asymmetric, narrowed a good deal to the base, truncate, entire, prolonged at one side into a short acute point, ciliolate at the margin and sprinkled with brown scales; involucrophorum short, subcupular, shaped like a swallow's nest, very obliquely truncate, half exsert from its own spathel, adnate to the base of the one above, bidentate and two-keeled on the side next to the axis; involucre slightly exceeding the involucrophorum, more or less irregularly cupular, often asymmetric, excavate and bidentate on the side of the neuter flower, the areola of which is depressedly lunate. *Female flowers* about 4 mm. long; the calyx divided down to the middle into 3 ovate-acute lobes; segments of the corolla lanceolate-acute, as long as the lobes of the calyx; stamens forming by the united bases of their filaments a cup as high as the third-part of the corolla and crowned by 6 broadly triangular and suddenly subulate teeth. *Fruiting perianth* not distinctly pedicelliform, with the calyx split not quite to the base. *Fruit* ovoid-elliptic or subobovoid, suddenly narrowed into a short, conic beak, 15–18 mm. long, 10–12 mm. broad; scales in 18 series, flattish, very superficially channelled along the middle, almost shining, dirty straw-coloured with a reddish-brown intramarginal line which broadens near the point, this very short scarious, triangular, obtuse and finely erosely toothed. *Seed* ovoid, somewhat flattened, rounded at both ends, 10 mm. long., 7 mm. broad, 6 mm. thick, conve and rather deeply and irregularly pitted on the back, flattish and with an oblong and rather deep chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—Griffith's type-specimens were gathered at Pular in the Province of Mergui on the coast of Tenasserim, where it was also collected by Sir Dietrich Brandis in the Salween valley at 1000 met. elevation (Herb. Becc. and Calc.); in the Pegu Yomah at Wakyoung, *Kurz* No. 1473 in H. Calc. In the Andamans it seems a common plant, and I have seen from there numerous specimens collected by Kurz, Liebig, by Sir G. King's collectors (Herb. Calc.) and by Mr. Man (Herb. Becc.); in the Nicobars, *King's collector.*

In the Andamans it receives the name of "Wai," and it is employed by the natives to make knives known by the name of "Wai-chô" (*see* Man: the Andaman Islanders 69, 185). In Burma it is named "Yamata" according to Kurz.

OBSERVATIONS.—Griffith founded the species in the upper part of a leaf and the summit of a male spadix—materials which I have not seen, but some of the specimens at my disposal agree so well with the picture that Griffith has published of them that I have no doubt about their being conspecific.

I consider also the *Calamus* which Kurz described and figured as *latifolius*, and of which I have seen the specimen studied by him in the Calcutta Herbarium, as undoubtedly referable to *C. palustris.*

From the Andamans Mr. E. H. Man forwarded to me very complete specimens which, like those of Kurz, agree pretty well with those of the Tenasserim Coast; their leaflets are very variable in size, some attaining 45 cm. in length and 6 cm. in width with 7–9 costae, while others are 35–37 by 7–8 cm. In one specimen a leaf, probably a radical one, is not cirriferous but terminates in two broad leaflets confluent at their base.

In the male spadix and also in the armature of the leaf-sheaths *C. latifolius* resembles *C. ornatus* a good deal. As I have already observed, *C. palustris* is with difficulty distinguishable from *C. latifolius* (see observations on this species).

As *C. palustris* is a very variable species, I subjoin a few observations about the specimens from which I have derived the description above. Kurz's sterile specimen No. 1473 in H. Calc. from the Pegu Yomah evidently belongs to a very luxuriant plant probably not yet floriferous; the petiole is 20 cm. long, quite smooth above, 17 mm. broad, armed at the sides with robust straight spines; a leaf-sheath is strongly gibbous above and seemingly 3·5–4 cm. in diam; armed with very large, somewhat deflexed, quite light-coloured spines, of which some are as much as 3 cm. long with a base 10–14 mm. broad and concave beneath; the rachis in its upper part is obsoletely 3-gonous and strongly armed with black-tipped half-whorled claws; in the cirrus the whorls of the claws are gradually more approximate as they approach the summit; some of the segments are up to 50 cm. long and 9 cm. broad, elliptic-lanceolate, inequidistant and often inserted in pairs on each side of the rachis.

Another specimen of Kurz (No. 3319), also from Pegu (Herb. Calc.) seems to have been detached from a very robust plant. A leaf has a petiole 10 cm. long and 2 cm. broad, flat and with a few short straight prickles in its upper surface; the marginal prickles are also small; the leaflets are inequidistant, narrower than in No. 1473, 6–7 cm. broad. A portion of a female spadix with very young fruit has the primary spathes very sparingly prickly; the lowest 12 cm. long, flattened and two-edged, the edges acute and sparingly aculeate; the lowest partial inflorescence is 40 cm. long and bears 8 spikelets on each side.

I have observed no differences between the specimens from the Andamans and those of the Nicobars. In one specimen from these last islands the leaflets are sometimes geminate on each side, but not always so and are very broad, the largest measures 50 by 11 cm.; the primary spathes are rather densely armed with deflexed prickles, the secondary spathes are also prickly. In Liebig's specimen from the Andamans the leaf-sheaths are armed with the very large spines described above, solitary or 2–3 confluent together or even disposed in small series, or sometimes almost smooth.

PLATE 173.—Calamus palustris *Griff.* Base of a leaf (under surface); an intermediate portion of a leaf (under surface); summit of a male spadix; portion of the cane (all the above from a specimen collected by Man in the Andamans); detached mature fruits and seed from a specimen in the Calcutta Herbarium.

CALAMUS PALUSTRIS var. AMPLISSIMUS Becc.

DESCRIPTION.—Very robust. *Sheathed stem* 4·5 cm. and perhaps more in diam., armed as in the type with the usual very broad spines and furthermore with others many times smaller but of the same shape. *Leaves* very large, 3·5 m. in the pinniferous part in one specimen; petiole very robust and short, 7 cm. long, 3 cm. broad, and like the first portion of the rachis convex and smooth beneath, flat in the upper surface, where densely covered with very short erect broad-based prickles; cirrus very robust, fearfully armed with strong half-whorled black-tipped claws; leaflets not very numerous, in one specimen 35 in all, subequidistant, 12–25 cm. apart on each side, but with a tendency to be sometimes slightly approximate in pairs, alternate or subopposite, inserted with a distinct axillary callus, very large, up to 50 cm. long and 8–10·5 cm. broad, otherwise as in the type. *Female spadix* comparatively short and dense, apparently 1 m. in length (not seen entire); upper primary spathes barely aculeolate; the largest partial inflorescences 20 cm. long with 7–8 spikelets on each side; secondary spathes slightly aculeolate; spikelets rather thick, much shorter than in the type, 4–6 cm. long.

HABITAT.—Cultivated at Buitenzorg where it was introduced from the Calcutta Botanical Garden.

OBSERVATIONS.—The very large size of the entire plant and the subequidistant leaflets distinguishes this from the other varieties of *C. palustris.*

PLATE 174.—Calamus palustris *var.* amplissimus *Becc.* Upper portion of the sheath with base of the leaf; the base of the leaf following that of the preceding figure seen from the upper surface; terminal portion of a female spadix.—From the specimen cultivated at Buitenzorg as mentioned above.

CALAMUS PALUSTRIS var. MALACCENSIS Becc.

DESCRIPTION.—*Sheathed stem* 2·5–3 cm. in diam. *Leaf-sheaths* armed with numerous laminar unequal long or short usually scattered and horizontal spines; petiole moderately long with short prickles at the margins and beneath along the middle; leaflets not very numerous, very irregularly set in pairs or even ternate on each side with a solitary one interposed (the groups very remote on each side, subopposite or alternate with those of the other side), rigidulous, acutely 5–7 costulate, naked on both surfaces or with a few spinules above on the mid-costa, lanceolate, narrowed to both ends, but more towards the summit, margins distinctly and closely ciliate-spinulous, especially from the middle upwards; the largest leaflets, the intermediate ones, 30–33 cm. long, 3–4 cm. broad. *Male spadix* rather diffuse, ·6–1 m. long; spikelets more slender than in the type.

HABITAT.—The Malayan Peninsula in the district of Perak, *Scortechini* No. 50^b in Herb. Becc. It is called by the Malays "Rotang Getah," a name which however is assigned also to other species. It grows in damp places.

OBSERVATIONS.—The leaflets are narrower and more irregularly set than in Griffith's picture of the typical plant. It is also a smaller and more slender plant than that from Pegu, the Andamans and the Nicobars, and has a more slender male spadix and spikelets.

CALAMUS PALUSTRIS var. COCHIN-CHINENSIS Becc. in Rec. Bot. Surv. Ind. ii. 211.

DESCRIPTION.—Smaller than the type. *Stem* very long, when with the sheaths on apparently 2·5 cm. thick; naked canes 12–13 mm. in diam., polished. *Leaves* not seen entire, but apparently moderately large; petiole . . . . . ; rachis in the intermediate portion, probably from a radical leaf, with a very obtuse salient angle in the upper surface, armed underneath along the middle with remote solitary straight or slightly hooked 1–2 cm. long spines (in the leaves of the upper part of the plant probably the rachis is clawed as usual); leaflets in distant pairs on each side of the rachis, with long vacant spaces interposed, the two of each pair very close together, narrowly lanceolate or oblanceolate, 15–35 cm. long, 4–5 cm. broad, with 5–6 slender costae naked on both surfaces, slightly concavo-convex, narrowed towards the base, gradually acuminate at the summit, tip smooth or slightly bristly-spinulous, margins inconspicuously and very adpressedly spinulous—the lower one in the upper surface usually bordered by a shining band. *Male spadix* . . . . . *Female spadix* decompound with a few partial inflorescences in its lower part and some simple spikelets at each primary spathe upwards and terminating with a small and short aculeolate tail-like appendix; the larger partial inflorescences, the lowest 20–25 cm. long with 6–7 spikelets on each side; primary spathes tubular, closely sheathing, slightly enlarged above, obliquely truncate and entire at the mouth; the first keeled on the back, the upper ones flat or even channelled at the base on the inner side, more or less armed with short, scattered, straight, slightly deflexed spines; secondary spathes sparingly aculeolate, tubular-infundibuliform, obliquely truncate and entire at the mouth, prolonged at one side into a short point; spikelets arched, spreading, 3–5 cm. long, inserted just at the mouth of their own spathe not or slightly callous at the axilla, with 6–12 very approximate flowers on each side. *Female flowers* approximate, 4 mm. long. *Fruiting perianth* not pedicelliform, its calyx almost entirely split down to the base. *Fruit* broadly ovoid-ellipsoid, 15 mm. long, 9 mm. broad, suddenly narrowed at the summit into a conic beak; scales as long as broad, rather opaque, almost flat, not or very indistinctly channelled along the middle, of a dirty straw colour with a dark shining chestnut-brown intramarginal band, which broadens towards the tip; this triangular, somewhat elongate, rather acute, not very appressed, its margins finely erosely toothed. *Seed* rounded at both ends, 6 mm. long, 5 mm. broad, convex and rather deeply pitted on the back, flattish and with an elliptic and rather deep chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—Camboja, prov. Ipong on the Kuang Repen mountains and in Lower Cochin-China on the Dinh mountains near Baria, *Pierre* No. 4847.

Native names: "Ichuan" in the Kmer language and "May roup" or "Mai tau" in Annam (*Pierre*).

OBSERVATIONS.—Distinguishable from the type by its smaller dimensions, the narrower leaflets and the female spikelets shorter; the fruit smaller and more globose; the scales with a slightly longer tip. Probably the leaf-specimens which accompany the fruit-spadices in Pierre's Herbarium are from the lower part of the stem or from a young plant, as the rachis is armed with straight and not hooked spines—a fact which is of common occurrence in many species of *Calamus.*

I should have been much inclined to refer to this variety of *C. palustris* the *C. verus* of Loureiro, whose description of the leaves corresponds sufficiently well, but that of the spadix is apparently of a *Daemonorops.*

PLATE 175.—Calamus palustris *var.* cochin-chinensis *Becc.* Basal portion of a (radical?) leaf from underneath; summit of a fruit spadix.—From Pierre's No. 4847 in Herb. Becc.

147. CALAMUS LATIFOLIUS Roxb. Fl. Ind. iii. 775; Kunth Enum. Plant. iii. 207; Mart. Hist. Nat. Palm. iii. 208 (1st edit.) and 339, t. 160 f. v; Griff. in Calc. Journ. Nat. Hist. v. 60 and Palms Brit. India, 86, t. cxcviii (excl. *Katu-tsjurel* Hort. Malab. xii. t. 56); Kurz in Journ. Asiat. Soc. Bengal, xliii. (1874), 210 (partly and excl. t. xxxi A), and For. Fl. Brit. Burma, ii. 518 (partly); Hook. fil. Fl. Brit. Ind. vi. 455 (excl. *C. inermis* T. And.); Becc. in Rec. Bot. Surv. Ind ii. p. 211.

C. humilis Roxb. Fl. Ind. iii. 773.

C. macracanthus T. And. in Journ. Linn. Soc. xi. (1869), 10; Gamble, Man. of Ind. Timb. p. 424.

Description.—High scandent and of moderate size. *Sheathed stem* about 3 cm., and the naked canes 15 mm. in diam.; internodes about 25 cm. long. *Leaf-sheaths* non-flagelliferous, strongly gibbous above, more or less armed with very large laminar elastic elongate-triangular sublanceolate, 2–3 cm. long spines, which are solitary or scattered, but more frequently confluent and with intervals of 3–6 cm., more or less irregularly whorled, their base is swollen above and concave beneath. *Ocrea* very short, axillary, liguliform. *Leaves* of the upper part of the adult plant 2–2·5 m. in length in the pinniferous part; the cirrus itself another metre long and armed with numerous strong, more or less aggregate irregularly half or ¾-whorled claws; petiole short and stout, 10–20 cm. long, rounded and unarmed beneath, the margins acute at first, obtuse upwards, more or less spinulous, flattish and usually smooth above; rachis in the first portion convex on both surfaces and armed with solitary strong claws beneath; in the upper part obtusely bifaced and smooth above and obsoletely angular beneath, where armed with half-whorls of strong claws; leaflets relatively few, 28–30 in all, very inequidistant, not very regularly geminate on each side of the rachis, with irregular vacant spaces (15–25 cm. long) interposed (the pairs of one side subopposite or alternating with those of the other side), thinly papyraceous and rather flaccid in texture, green, subconcolorous on both surfaces, broadly lanceolate or elliptic-lanceolate conspicuously concavo-convex, very often streaked along the lower margin and often also on the blade in the upper surface with one or more brown, polished, longitudinal bands, narrowed towards and acute at the base, where not callous at their insertion, rather shortly acuminate into a not very long and bristly-hispid apex; the intermediate ones, the largest, 30–35 cm. long, 6–8 cm. broad, 5–7-costulate; the lower ones and those of the summit much smaller and 3–5-costulate; the mid costa barely distinguishable from the side ones, all tenuous and not very prominent and naked on both surfaces; secondary nerves rather distinct and numerous; transverse veinlets very minute, rather crowded; margins appressedly spinulous. *Leaves* of the young plants not cirriferous and terminating in two leaflets more or less united by their base and with the petiole more or less elongate, semiterete and variously spinous. *Male spadix* (see var. *marmoratus*). *Female spadix* simply decompound, rigid, erect, paniculate, not very diffuse, shorter than the leaves, in one specimen about 60 cm. long with not many (3–4) rather approximate spreading partial inflorescences on each side, and terminating in a very small and short aculeolate tail-like appendix; primary spathes 7–8 cm. long, coriaceous, tubular, closely sheathing, the first compressed, with two acute and spinuous edges, the upper ones more cylindraceous, slightly enlarged above, more or less armed on the outer side with rather robust subdeflexed spines, truncate and entire at the mouth and prolonged at one side into a triangular, more or less decayed and dorsally keeled point; partial inflorescences rather short, terminating in a short (about 1 cm. long) tail-like appendix, the lower ones, the largest, 15–20 cm. long, with 4–6 spikelets on each side; secondary spathes fugaciously scaly-furfuraceous, tubular-infundibuliform, slightly obliquely truncate, entire and ciliolate at the mouth, apiculate at one side, aculeolate towards the summit on the outer side; spikelets spreading, inserted just at the mouth of their own spathe, not distinctly callous at their axilla, the lower ones, the largest, 4–5 cm. long, somewhat zig-zag sinuous, bearing 8–10 rather approximate flowers on each side; the upper ones shorter and with fewer flowers; spathels more or less scaly-furfuraceous, short, obliquely and broadly infundibuliform, narrowed a good deal to the base, faintly striately veined, entire, apiculate at one side, ciliolate-paleaceous at the mouth; involucrophorum enclosed into its own spathel and inserted at the base of that above, dimidiately cupular, rather deep, very acutely bidentate, two-keeled and deeply excavate on the side next to the axis, where not callous; involucre moulded on and immersed in the involucrophorum with 2 projecting teeth (separated by a sinus) on the side of the neuter flower, of which the areola is distinctly lunate and with sharply defined borders. *Female flowers* about 5 mm. long; the calyx finely striately veined, cut half-way down into 3 broad semi-ovate acute lobes; segments of the corolla as long as the calyx but narrower; filaments of the stamens united by their bases into a cup, triangular and black in the free portion. *Fruiting perianth* not distinctly pedicelliform. *Fruit* . . . . .

HABITAT.—It ranges from Chittagong in Bengal to the sub-Himalayan hills of Sikkim, Nepal and Bootan ascending from the level of the sea to an elevation of about 700 metres.

Roxburgh has founded the species upon specimens gathered in Chittagong near the coast, where it has been found again at Seetakoond (*Hooker f.*) and at Paroha (*Gamble*). According to Anderson it grows in Sikkim near the stream Rayem in the Teesta valley at an altitude of 150 metres, about 4 miles from the plain; the same author adds that he has observed it (his *C. macracanthus*) in the valleys between the Teesta and Tchail in the first hills of Bootan. From Sikkim Lieut.-Col. Prain has forwarded me specimens (those I have described) with very young fruit, gathered on dry ground at Sivoke on the gentle outer slopes of the Himalaya.

The native name in Chittagong assigned by Roxburgh is "Korak-Bhet." Anderson gives the Lepcha names of "Ruebee" and "Greem," and Gamble that of "Phekori-Bhet." Its rattan is very long, and when freed from the sheaths is about as thick as a slender walking cane.

OBSERVATIONS.—*C. latifolius* is characterized by large leaves which are cirriferous in the full-grown plant, with very concavo-convex 5–7-costulate, lanceolate leaflets, which are distinctly geminate on each side of the rachis with long vacant spaces interposed, and the large flat often subregular verticillate spines of its leaf-sheaths. I think, however, that *C. latifolius* is distinguishable with great difficulty from *C. palustris*; only the leaflets of the first seem more herbaceous in texture, more regularly geminate, more concavo-convex and not furnished with an axillary callus at their insertion and the spines are more distinctly confluent in whorls; other difference perhaps may be found in the fruit, which in *C. latifolius* is known only in a very young state. If the identity of the two mentioned species could be proved, the name of *C. latifolius* has the precedence as more ancient.

The young plants of *C. latifolius* are erect and have not cirriferous leaves. In fact one leaf from a young plant of this species collected by Sir Dietrich Brandis at Sivoke on the Teesta terminates in a large bipartite leaflet. From this I am inclined to suppose that Roxburgh had assigned the name of *C. humilis* (also a native of Chittagong) to a young plant of *C. latifolius* or perhaps of *C. inermis*—two species very difficult to distinguish in the juvenile stage. Griffith also very likely speaks of young plants of *C. latifolius* when he writes:—"There were also specimens found among the dried plants of the Botanic Garden without names, but which are said to have been prepared from plants growing a long time ago in the Gardens; these, had the petioles (rachis Becc.) been flagelliferous, I should have referred to *C. latifolius*"; Palms Brit. India, p. 67 under *C. floribundus*. Furthermore in the large work of Griffith in the observations on *C. latifolius*, we read:—"I have a personal knowledge of this species", whereas in the Calcutta journal the same phrase is written:—"I have *no* personal knowledge, etc."; this last version being doubtless the correct one, as the description and the plate of *C. latifolius* in Griffith's work are from Roxburgh; moreover in the same lines in the Calcutta journal the author adds:—"It (*C. latifolius*) appears to be allied to the succeeding species;" viz. *C. palustris*, and this is perfectly correct, while in the illustrated large work the succeeding species are *C. insignis* first, then comes *C. geminiflorus* and lastly *C. palustris*. It clearly follows from the above that Griffith made the comparison between *C. latifolius* and *C. palustris*, as the place of *C. insignis* has been changed and *C. geminiflorus* added by the publisher of the posthumous edition. As to *C. macracanthus* T. And., I have no reason to doubt its identity with *C. latifolius*.

PLATE 176.—Calamus latifolius *Roxb.* Portion of the sheathed stem with base of a leaf and lower portion of a female spadix; very young detached fruits belonging to the above-mentioned specimen.—From a specimen collected in Sikkim and forwarded to me in 1902 by Lt.-Col. D. Prain.

CALAMUS LATIFOLIUS var. MARMORATUS Becc.

DESCRIPTION.—High scandent, more slender than the type. *Sheathed stem* 2 cm. in diam.; naked canes 1 cm. thick with a polished surface and internodes 15–20 cm. long. *Leaf-sheaths* of the younger shoots marbled with alternating mealy white and dark green transverse bands, more or less armed as in the type with broad solitary or subverticillate spines and furthermore in the intervals with much smaller triangular spines, which have a broad base and are at first adpressed and erect and afterwards horizontal and disposed in transverse unequal interrupted undulate series. *Leaves* smaller than in the type and with fewer pairs of leaflets, these also smaller, the largest 25–28 cm. long, 6 cm. broad, but exactly of the same shape, conspicuously concavo-convex, usually oblong or oblanceolate, distinctly geminate on each side, with one or more broad longitudinal shining bands on the upper surface; petiole with a few erect spinules on its upper surface. *Male spadix* simply decompound, similar to the female one of the type, but with more densely spinous primary spathes; spikelets comparatively broad, about 3 cm. long, with 8–12 flowers on each side; spathels very closely packed, bracteiform, concave, sometimes with a denticulate margin and prolonged at one side into a triangular acute point, which projects beyond the involucre and subtends the flower; involucre dimidiately cupular, deep, acutely bidentate, sharply two-keeled and deeply excavate on the side next to the axis. *Male flowers* ovate, 5 mm. long; the calyx finely striately veined, divided about midway down into 3 broad acute lobes; the corolla one-third longer than the calyx.

HABITAT.—Sikkim Himalaya. Lieut.-Col. Prain, who kindly forwarded me the specimens with spadices I have described above, says of this variety that it occurs in the plains below Sivoke (outer slopes of Himalaya) on damp ground, and that it is a long rambler over trees. Lepcha name "Ruebee" (Prain). To this variety must be referred also a specimen presented to me by Sir Dietrich Brandis, who collected it in the district of Jalpaiguri in the Western Duars in Bengal and another from the Daarbund Pass in Cachar (Keenan in Herb. Kew). All these specimens have the newly-exposed leaf-sheaths marbled or mottled.

OBSERVATIONS.—The type-specimens of *C. latifolius* seen by me have only female and the variety only male spadices, but very likely no appreciable differences exist between the spadices of the type and those of the variety. The variety *marmoratus* is based not only on the marbled appearance of the surface of the leaf-sheaths but also on the two different forms of spines with which they are covered and on its smaller size.

PLATE 177.—Calamus latifolius *var.* marmoratus *Becc.* Portion of the sheathed stem with base of a leaf and with an entire male spadix; an intermediate portion of a leaf (under surface); leaf-sheath with base of a leaf from the upper part of a young plant.—From Prain's Sivoke specimen in Herb. Becc.

148. CALAMUS SPINIFOLIUS Becc. in Rec. Bot. Surv. Ind. ii, 202.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 12-14 mm. in diam. *Leaf-sheaths* gibbous above, obliquely truncate at the mouth, mottled with very small green and white furfuraceous patches and armed with scattered subulate, slender, 5–10 mm. long, brown-tipped spines which leave a very distinct impression above them. *Ocrea* very short, forming a very narrow furfuraceous margin at the mouth of the sheath. *Leaves* of the upper and fertile part of the plant about 1 m. long in the pinniferous part and terminating in a filiform cirrus, armed with half-whorls of slender claws; petiole rather elongate (8–12 cm. long) sub-biconvex, covered with small straight prickles in its upper surface, also more or less armed at the sides and beneath with scattered straight spines; rachis armed beneath at first with solitary and then geminate and ternate claws in its upper part, bifaced and spinulous or smooth on the salient angles above; leaflets not very numerous (32 in one leaf) in pairs or in threes, very approximate by their bases on each side of the rachis with rather long vacant spaces interposed between the groups, the pairs or the groups usually not opposite, elliptic-lanceolate or oblanceolate, broadest about or above the middle and thence tapering to an acuminate and bristly point, gradually attenuate to and acute at the base, all (except a few near the summit) of about the same size, 12–16 cm. long, 2–2·5 cm. broad, rigidulous, papyraceous, green and concolorous on both surfaces, 3- or sub-5-costulate, the mid-costa, and often 1–2 of the side costae, furnished with a few rigid straight needle-like black-tipped, 3–8 mm. long spines; in the lower surface all the nerves faint and naked; transverse veinlets sharp, approximate, sinuous and interrupted; margins rather closely and spreadingly spinulous; often the lower margin in the upper surface bordered by a rather broad shining band. *Male spadix* slender; elongate, erect, attached towards the summit of the sheath, more or less covered in every part with small adpressed rusty-furfuraceous scales, shorter than the leaves, in one specimen about 60 cm. long with 8 partial inflorescences and terminating with a very short aculeolate tail-like appendix; primary spathes tubular, slightly enlarged above, closely sheathing, narrow, plano-convex and unarmed at the base, somewhat flattened and keeled externally in their upper part, where armed with a few horizontal straight spinules, obliquely truncate, entire and ciliate-paleaceous at the mouth and prolonged at one side into a triangular acute point; the first somewhat larger and longer than the others with the edges acute and armed with small acicular dark spinules; partial inflorescences inserted about the mouth of their respective spathe, spreading, strict, slender; the lower ones, the largest, about 15 cm. long, with 4–5 spikelets on each side, the upper ones somewhat shorter; secondary spathes tubular-infundibuliform, unarmed, prolonged at the summit into a triangular acute erect point; spikelets small, brittle, erect (not spreading), attached at the mouth of their respective spathes; the lower ones, the largest, 2–2·5 cm. long, with 14–15 flatly bifarious flowers on each side; spathels very approximate, concave, subcymbiform, rusty-furfuraceous, ciliate, with a broad rather obtuse point, which subtends and embraces the base of the flowers; involucre concave, subcupular, included in the spathes. *Male flowers* oblong, obtuse, 3 mm. long; the calyx cupular, shortly and broadly 3-toothed; the corolla 3 times as long as the calyx and even more, its segments oblong, polished outside. *Female spadix* . . . . .

HABITAT.—Philippines; in Arayat, Central Luzon, *A. Loher* No. 1373, XII, 1893, male specimen in Herb. Kew. The sterile specimen upon which the species was founded was collected by Vidal at Igbaras in the province of Ilo-ilo, Island of Panay (No. 3954 in Herb. Becc. and Kew).

OBSERVATIONS.—Loher's specimen is of the upper part of an adult plant with a flowering male spadix, but the species was first based only on specimens of leaves of which I subjoin the description. I think, however, that little or no doubt remains about the conspecificy of the leaves with the fertile specimen described above on account of the peculiar spinules which arise from the main costae of the leaflets, though these spines be more numerous or larger in the radical than in the cauline leaflets. The radical leaves terminate in 2 leaflets, as usual in the species of the group to which *C. spinifolius* belongs (that of *C. palustris*); while the upper leaves are cirriferous at their summit; the rachis is armed beneath along the middle with a few scattered, slender, pale, almost straight spines, which become slightly hooked upwards; leaflets few (19 in the two leaves examined by me), inequidistant, approximate by twos on each side, 10–12 cm. long and 2·5–3·5 cm. broad, all about the same size, the lower ones narrower than the others, the two of the terminal pair shortly connate at the base, spoon-shaped or deeply concave beneath, oblong, oblanceolate or subobovate, gradually narrowed towards the base, rather suddenly acuminate into a bristly-spinous apex, glabrous, green (when dry), subconcolorous on both surfaces, with 5 acute costae, all running from the base to the extreme apex, each costa provided in the upper surface, especially near the base, with 2–4 needle-like, straight rigid pale black-tipped spines, 4–8 mm. long; in the lower surface the costae are less prominent and quite smooth; secondary nerves slender; transverse veinlets very distinct, rather close, sinuous and interrupted; margins acute, ciliated mainly near the base with remote spinules. It seems a general rule that the radical leaves in the species of this group are not only non-cirriferous but also that their leaflets have more primary nerves than those of the leaves of the upper part of the plant, and furthermore have more nerves with bristles or spinules.

PLATE 178.—Calamus spinifolius *Becc.* An entire leaf (upper surface), probably a radical one.—From Vidal's No. 3954 in Herb. Kew.

PLATE 179.—Calamus spinifolius *Becc.* Portion of the sheathed stem with an entire male spadix in flower; the summit of a leaf.—From Loher's No. 1373 in Herb. Kew.

149. CALAMUS TRISPERMUS Becc. in Perkins Fragm. Fl. Philipp. i. 46.

DESCRIPTION.—Apparently scandent and rather large. *Leaf-sheaths* . . . . . *Leaves* of the upper part of the plant (the only leaf seen by me probably a radical one) non-cirriferous; its rachis unarmed, and slightly convex beneath and acutely bi-faced above; leaflets few inequidistant, approximate in pairs on each side of the rachis, somewhat concavo-convex, oblanceolate, broader above the middle, rather suddenly contracted at the summit into an acuminate and at the sides bristly tip, gradually narrowed to the base, 30–32 cm. long, 6 cm. broad, the two of the terminal pair somewhat smaller and free at the base, distinctly 5-costate, the costae acute in the upper surface, very slender beneath, naked on both; transverse veinlets very slender, but very sharp on both surfaces, extremely approximate and much continuous margins finely closely and adpressedly spinulous, the lower margin on the upper surface usually bordered with a narrow shining band. *Male spadix* . . . . . *Female spadix* apparently panicled and large (not seen entire); primary spathes . . . . .; partial inflorescences 40–45 cm. long with 5–6 spikelets on each side; secondary spathes about 5 cm. long in the exposed part; tubular, slightly enlarged above, very closely sheathing, flat on the inner side towards the base, with a few, short, hooked prickles on the back near the summit, horizontally truncate and fringed, paleaceous at the mouth, prolonged at one side into a short triangular acute point; spikelets inserted at the mouth of their own spathe, ascendent, vermicular, large, robust, slightly flexuous; the lower ones 12–16 cm. long with 12–15 flowers on each side; the upper ones somewhat shorter; spathes smooth, coriaceous, shortly asymmetrically infundibuliform, slightly prolonged at one side into a triangular point, horizontally truncate and entire at the mouth; involucrophorum laterally attached in the hollowed base of the spathel above its own and almost exsert from this, two-keeled and with two prominent acute teeth on the side next to the axis; involucre irregularly cupular, deeply excavate and acutely bidentate on the side of the neuter flower of which the areola is lunate and sharply bordered. *Female flowers* flatly bifarious, rather distant, about 6 mm. long. *Fruiting perianth* explanate (not pedicelliform); the calyx coriaceous divided almost to the base into 3 ovate acute parts; the segments of the corolla narrower and about as long as the lobes of the calyx. *Fruit* broadly obovoid, suddenly and rather acutely beaked, 18 mm. long, 12–13 mm. broad (when not quite mature); scales in 15 longitudinal series and each series of about 12 scales, not taking into account the very small ones near the base and the mucro, shining, faintly and broadly channelled along the middle, yellow-straw-coloured with a rather broad red-brown marginant line and with a rather obtuse point and a finely erosely toothed margin. *Seeds* 3, with a smooth surface, 12 mm. in length, convex on the back, and with 2 flat faces which are divided by a salient angle on the inner side; albumen equable; embryo basal.

HABITAT.—The Philippines; Antipolo, prov. Rizal in Luzon, *Merrill*, No. 1645 in Herb. Berol.

OBSERVATIONS.—I have seen of this 3 partial inflorescences with nearly mature fruit and the upper part of a leaf, 60 cm. in length, with 6 leaflets (in 3 pairs) on each side. This I suppose a radical leaf and as it is not cirriferous, as is usual in the *Calami* of the *palustris* group to which I would refer *C. trispermus*, therefore very probably the upper leaves are cirriferous.

C. trispermus is extremely like *C. manillensis*, but this has a sphæric shortly mucronate fruit with fewer and larger scales than in *C. trispermus.*

PLATE 180.—Calamus trispermus *Becc.* The summit of a leaf (upper surface), and its (detached) basal portion from under surface; portion (an entire partial inflorescence) of a fruit-spadix.—From Merrill's No. 1645 in Herb. Berol.

150. CALAMUS MANILLENSIS H. Wendl. in Kerch. Les Palm., 237; Becc. in Rec. Bot. Surv. Ind. ii. 215.

Daemonorops? manillensis Mart. Hist. Nat. Palm. iii. 330, pl. 175. VIII, f. 1–3 Walp. Ann. iii. 480 and v. 829.

DESCRIPTION.—*Stem* . . . . . *Leaves* . . . . . *Female spadix* large; primary spathes . . . . .; secondary spathes tubular, thinly coriaceous, armed in their upper part with small hooked prickles, and prolonged at the summit into a lanceolate, dorsally keeled, acute point; spikelets large, in one specimen 18 cm. long, thickly vermicular, cylindraceous, inserted just at the mouth of their own spathes, with about 15 flowers on each side; spathels shortly tubular-infundibuliform or obconic, 5–6 mm. long, slightly asymmetrical, entire, ciliate and exactly truncate at the mouth, where 6–7 mm. in diam., slightly apiculate at one side, unarmed, furfuraceous; involucrophorum laterally attached in the hollowed base of the spathel above its own and exsert from this, two-keeled and with two prominent acute teeth on the side next to the axis; involucre irregularly cupular, deeply excavate and acutely bidentate on the side of the neuter flower of which the areola is lunate and sharply bordered. *Female flowers* flatly bifarious, rather distant, 5 mm. long. *Fruiting perianth* explanate (not pedicelliform), the calyx split almost to the base into 3 ovate, rather acute, thinly coriaceous parts; segments of the corolla lanceolate-acute, as long as the calyx; stamens with filaments united by their bases and forming a short ring, suddenly contracted, linear-subulate in the free part. *Fruit* globose, 15–17 mm. in diam., the base round, the top slightly depressed and shortly mucronate; pericarp very thin and brittle; scales not very numerous in 12 longitudinal series, each series of about 6 well-conformed scales, taking no account of the smaller ones of the base and of the mucro, comparatively large, broader than long (7 mm. in width), very thin, rather deeply channelled along the middle, shining, straw-coloured with paler scarious erosely toothed, and towards the obtuse point reddish-brown margin. *Seeds* 3, or 1 perfectly evolute and 2 abortive, 11–12 mm. in length; when 3 convex on the back with an obtuse angle dividing 2 flat faces on the inner or axial side, covered by the very adherent crustaceous integument; the testa smooth, spadiceous, not pitted nor tubercled; chalazal fovea very minute, punctiform, in the centre of the convex side; albumen equable; embryo basal.

HABITAT.—The Philippine Islands; at Manila, *Gaudichaud*, voyage of the "Bonite", Dec. 1836.

OBSERVATIONS.—I have seen of this only two perfectly similar spikelets, with a few mature fruits still attached, these partly bruised, the scaly pericarp being very thin and fragile. One of the spikelets is preserved in Delessert's Herbarium at Geneva, and has a small portion of the upper part of a secondary spathe, the other, certainly of the same gathering as the above, is in the Paris Herbarium with the label: "Guital: Rotin à fruits blancs écailleux." With such scanty material it is difficult to point out the affinities of this species. It is, however, closely related to *C. trispermus* but distinct from it by its fragile larger round fruit.

PLATE 226 I, Fig. 1.—Calamus manilensis *H. Wendl.* Spikelet with mature fruit; fig. 2, one of the 3 seeds contained in a fruit as seen from the inner side; fig. 3, the same seed from the external side; fig. 4, the same seed longitudinally cut through the embryo and the chalazal fovea.

151. CALAMUS AXILLARIS Becc. in Hook. fil. Fl. Brit. Ind. vi, 456, and in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—Scandent. *Sheathed stem* 2 cm. in diam. not flagelliferous, gibbous above, irregularly armed with horizontal or slightly deflexed, broad-based, short, rigid, brown-tipped spines, of which the largest 1 cm. long, and the smallest reduced to a spinescent tubercle, their base concave beneath and tumescent above. *Leaves* rather large, terminating in a rather long slender cirrus; this densely armed with half-whorled small claws; petiole almost obsolete; rachis in its pinniferous part about 1 metre in length, flat above in its basal portion, then convex and upwards irregularly bifaced with a not very acute salient angle; roundish and naked beneath in the basal portion and armed upwards with at first solitary and then ternate claws; leaflets not very numerous (in one specimen 36 in all), inequidistant but not distinctly fascicled, often geminate on each side towards the summit, subregularly alternate near the base, rigidulous, papyraceous, narrowly lanceolate or subensiform, subconcolorous and subshining on both surfaces, almost equally narrowed to both ends, acute at the base, acuminate into a slightly spinulous tip, 3- or sub-5-costulate, the mid-costa acute, and though slender stronger than the others, all quite naked on both surfaces; transverse veinlets much interrupted, not very conspicuous, indistinctly spinulous; largest leaflets, those of the lower third part, up to 32 cm. long and 2 cm. broad; the upper ones a good deal shorter but slightly larger, many of those near the base long and very narrow, more distinctly callous at their axilla than the upper ones. *Male spadix* apparently axillary, in one specimen 1·4 m. long, slender, almost entirely unarmed, projecting erect from the axilla of a leaf, nodding upwards, partially supradecompound with a few partial inflorescences, not flagelliferous at the summit and terminating in a spikelet; primary spathes more or less fugaciously scaly-furfuraceous, finely longitudinally striate, the first tubular, closely sheathing, strongly flattened, ancipitous, the edges acute, almost unarmed, the following also somewhat flattened: the upper ones more cylindraceous, slightly enlarged and somewhat loosely sheathing in their upper part, suddenly narrowed at the base into a strongly flattened unarmed axial portion, smooth or with a straggling prickle near the summit, obliquely truncate, entire and naked at the mouth and prolonged at one side into a triangular acute or shortly acuminate point; partial inflorescences 12–20 cm. apart one from the other, ascendent, attached outside their respective spathes, the lower ones 2 cm. long, branched at the base, the others gradually smaller, those near the summit with 3–4 spikelets only; the upper spathes much reduced in length and with simple spikelets, similar to those of the partial inflorescences; secondary spathes elongate-infundibuliform, narrow and angular at the base, enlarged and loosely sheathing in their upper part, truncate, entire and ciliolate at the mouth and fugaciously scaly-furfuraceous; the simple spikelets 2–2·5 cm. long, inserted at the mouth of their own spathe, not callous at their insertion, ascendent and strongly arched-subscorpioid, with 6–12 flowers on each side, not always exactly flat or on one plane, the two series being slightly assurgent; spathels short, close together, bracteiform, unilaterally evolute, concave, broadly ovate, apiculate a good deal longer than the involucre and subtending their respective flower, strongly veined, ciliate-paleaceous at the margin; involucre dimidiately cupular or like a swallow's nest, flat, two-keeled and acutely bidentate on the side next to the axis, the margin ciliate like the spathels. *Male flowers* when not quite full-grown ovate; the calyx deeply 3-toothed, striately veined. *Fruit* unknown.

HABITAT.—The Malayan Peninsula; in the district of Perak, *Scortechini.*

OBSERVATIONS.—I have seen of this only one specimen of the upper part of the plant with two leaf-sheaths, an entire leaf and a male spadix; this not inserted as usual laterally near the mouth of a spathe but lower down towards its base; owing to this the base of the spadix is covered by the sheath immediately below its own and emerges from the mouth of it at the axilla of the petiole.

The structure of the male spadix brings *C. axillaris* near to the species of the group of *C. inermis* or to those of the group of *C. palustris*, but more probably to those of the first and especially to *C. simplex;* it differs, however, from it not only in the curious character of the insertion of the spadix, but also in the shortly petioled leaves with rather numerous inequidistant not coupled, narrowly lanceolate green, concolorous, sub-5-costulate, naked leaflets.

In no other *Calamus* known to me is the insertion of the spadix so far remote from the summit of the sheath which produces it.

PLATE 181.—Calamus axillaris *Becc.* Portion of the sheathed stem with an entire male spadix; basal portion of a leaf (under surface); the summit of a leaf (upper surface).—From Scortechini's specimen in Herb. Becc.

152. **Calamus neglectus** Becc. in Hook. fil. Fl. Brit. Ind. vi. 458 and in Rec. Bot. Surv. Ind. ii. 213.

Description.—Very probably scandent and apparently rather slender. *Leaf-sheaths* . . . . . *Leaves* cirriferous, not seen entire; petiole . . . . .; rachis in its upper part acutely trigonous, glabrous, bifaced and smooth above, flat beneath where armed along the middle with solitary claws which become 3-nate upwards and regularly half-whorled in the cirrus; leaflets numerous equidistant, rather approximate, alternate or subopposite, thinly papyraceous, rather firm, green and subconcolorous on both surfaces, elongate and narrow or linear-lanceolate, somewhat narrowed to and acute at the base, long-acuminate into a subulate setose apex, with the mid-costa acute and one slender nerve on each side of it sprinkled with fulvous bristles in the upper surface; underneath the not prominent mid-costa only more or less covered with approximate minute hairs; transverse veinlets slender short and not very crowded; margins with rather remote fine hairs which are more spreading towards the summit; the largest leaflets, the lower ones in the specimen of the upper part of one leaf seen by me, 18–20 cm. long, 10–13 mm. broad, the others gradually smaller, the uppermost narrower and about one-half smaller than the lower ones, not taking account of a few diminutive ones at the base of the cirrus. *Male spadix* . . . . . *Female spadix* simply decompound (not seen entire), rather large, the axis robust and rigid with many rather approximate (8–10 cm. apart) partial inflorescences; lowest primary spathe . . . . .; upper primary spathes tubular-cylindraceous, thinly coriaceous, closely sheathing, rather short, somewhat narrowed to the base, where flattish on the inner side, almost polished, armed with scattered short broad-based claws, truncate and entire at the mouth, prolonged at one side into a short triangular point, this keeled on the back, where more densely prickly than elsewhere; partial inflorescences arising erect from or a little above the mouth of their own spathe and then speedily arched-spreading; those seen by me about 25 cm. long, their axis slightly sinuous, 3–4 mm. in diam. with 5–6 distichously alternate spikelets on each side; secondary spathes elongate-infundibuliform, pergamentaceous, glabrous, finely striate, sparingly spinulous truncate and entire at the mouth, prolonged at one side into a short triangular point; spikelets arched, spreading, inserted just above the mouth of their own spathe with a not conspicuous axillary callus, 6–7 cm. long, the lowermost barely longer than the extreme, with 8–10 alternately distichous rather remote flowers on each side; the axis zig-zag sinuous; spathels glabrous, short, broadly asymmetrically infundibuliform, narrowed a good deal to the base, entire and finely ciliolate at the mouth and prolonged at one side into a short, broadly triangular, acute point; involucrophorum laterally adnate outside its own spathel at the base of the one above, two-keeled and bidentate on the side next to the axis and slightly callous at the axilla; involucre irregularly cupular, striately veined like the spathels, obsoletely bidentate on the side of the neuter flower of which the areola is depressedly lunate and sharply bordered. *Female flowers* 4–5 mm. long, inserted at an angle of 45°. *Fruiting perianth* subpedicelliform, the calyx hardened and callous and split down not quite to the base into 3 very broad acute lobes; the segments of the corolla as long as the calyx but narrower than its lobes; staminal urceolum crowned by 6 triangular teeth. *Fruit* (immature) ovoid-elliptic, small, 6 mm. broad, suddenly contracted into a long cylindraceous beak; scales in 18 series, rather opaque, slightly convex not or very faintly channelled along the middle, light-brown yellowish with a dark red-brown marginant line which broadens towards the tip; this somewhat prolonged, triangular, not very adpressed, erosely toothed. *Seed* (very immature) apparently deeply pitted on the back with a rather deep chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—The Malayan Peninsula at Malacca, *Griffith;* Herb. of the late E. India Company, No. 6399 in Herb. Kew.

OBSERVATIONS.—This species is founded on the upper portion of a leaf and on a portion of a spadix with half-mature fruit. It must be very uncommon as it has not been found again by any of the modern collectors. It is distinguished in the group of *C. palustris* by its narrow elongate equidistant unicostate leaflets, which have the mid-costa and one slender nerve on each side of it sprinkled with fulvous bristles above, and underneath only the mid-costa closely hairy. In the fruit-spadix and especially in the structure of the spikelets, and in the form of spathels and involucre it approaches *C. palustris,* and in the narrow leaflets *C. viridispinus, C. simplex* and *C. bubuensis.*

PLATE 182.—Calamus neglectus *Becc.* Portion of a spadix with not quite mature fruit; summit of leaf (upper surface).—From Griffith's specimen No. 6399 in Herb. Kew.

153. CALAMUS BUBUENSIS Becc. sp. n.

DESCRIPTION.—Slender and apparently scandent. *Sheathed stem* about 12 mm. in diam. *Leaf-sheaths* rusty-furfuraceous, very densely armed with very unequal horizontal or slightly deflexed solitary spines of which the larger ones laminar, often slightly sinuous or undulate, light coloured and of a greenish hue with a dark tip, broad and often laciniate at the base, 10–15 mm. long; with these are intermingled many others much narrower and often setiform. *Ocrea* rather elongate, brown, exsuccous, brittle, hispid. *Leaves* cirriferous, in one specimen 55 cm. long in the pinniferous part; the cirrus filiform, minutely clawed; petiole rather elongate (7 cm. long), flattish and smooth above, convex beneath, armed at the sides with a few horizontal straight spines; rachis armed at the sides with short prickles and along the middle beneath with claws which are solitary at first and become ternate towards the summit; in the upper surface acutely bifaced from a little above the base and smooth throughout; leaflets not numerous (31 in one leaf), very inequidistant, irregularly grouped, but not very approximate by their bases, all in one plane (not pointing different ways) papyraceous, rigidulous, linear-lanceolate, very acuminate into a subulate and bristly apex, green, slightly paler beneath, tricostulate, the mid-costa acute and the side costae slender, all naked on both surfaces; transverse veinlets sharp not very crowded, much interrupted; margins smooth; the largest leaflets, those a little above the base, about 20 cm. long, 12 mm. broad; the upper ones gradually shorter but scarcely narrower. *Male spadix* simply decompound, rigid, straight, slender, erect, shorter than the leaves (40 cm. long in one specimen), not cirriferous at its summit, with 4–5 gradually diminishing partial inflorescences, quite unarmed; primary spathes narrowly infundibuliform, slender and flattened at the base, membranous or papyraceous and rather loose in their upper part, entire, naked and very obliquely truncate at the mouth, prolonged at one side into a triangular acuminate dorsally keeled and erect point, the first longer but otherwise not differing from the others, flattened with acute naked edges; partial inflorescences coming forth erect from the mouth of their respective spathes: the lower ones 8–10 cm. long with very few spikelets: the upper ones reduced to very few spikelets; secondary spathes very narrowly tubular-infundibuliform, closely sheathing; spikelets spreading, attached at or above the mouth of their respective spathes with a distinct axillary callus, the larger ones, the lowest, 2–2·5 cm. long with 7–8 flatly not very approximate bifarious flowers on each side; spathels very shortly broadly and unilaterally infundibuliform, entire, prolonged at one side into a short triangular point which subtends its own flower; involucre almost exsert from its own spathel and laterally attached to the base of the one above, almost regularly cupular and entire. *Male flowers* ovoid-oblong, slightly narrowed to the summit, 4 mm. long; the calyx indistinctly veined, divided down almost to the middle into 3 broadly triangular acute teeth; the corolla almost twice as long as the calyx, its segments polished outside. *Female spadix* . . . . .

HABITAT.—The Malayan Peninsula. Discovered by L. Wray, Jr., in March 1890 on Gunong Bubu in the district of Perak at about 1,900 metr. above the level of the sea (Herb. Kew.).

OBSERVATIONS.—Apparently a very localized mountain species. The specimens I have examined consist only of an entire leaf with a good portion of its leaf-sheath and a male spadix in flower. The species is distinguished from the allied ones by its small size; its leaf-sheaths armed with slender sub-bristly and larger laminar spines, these often multifid from the base and light-coloured; its inequidistant 3-costate narrow leaflets, with the costae and margins quite smooth; and its slender, rigid, unarmed male spadix. The nearest ally seems *C. neglectus*, but this has equidistant leaflets.

PLATE 183.—Calamus bubuensis *Becc.* An entire leaf with its leaf-sheath; an entire male spadix.—From Wray's type-specimen in Herb. Kew.

154. CALAMUS VIRIDISPINUS Becc. in Hook. fil. Fl. Brit. Ind. vi. 458, and in Rec. Bot. Surv. Ind. ii. 213.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 8–15 mm. in diam. *Leaf-sheaths* not flagelliferous, somewhat gibbous above, rusty-furfuraceous, very densely armed with spines of unequal length, greenish brown or schistaceous when dry, furfuraceous, fringed at the margin at first, the largest flat, 1–2 cm. long, rather broad at the base, horizontal or slightly deflexed, these intermingled with others very short deflexed or ascendent. *Ocrea* inconspicuous or deciduous? *Leaves* rather elongate, 35–50 cm. long in the pinniferous part, terminating in a slender cirrus; this armed with half-whorls of black-tipped very sharp claws; petiole variable in length, 10–35 cm. long, flat and smooth above, rounded beneath, more or less prickly at the margins, rachis a little above the base speedily becoming bifaced, roundish and more or less irregularly clawed beneath; leaflets rather numerous, very distinctly approximate on each side into 4–6 groups; each group composed of 2–5 leaflets, which are approximate but inequidistant among themselves and disposed on one plane (the groups sub-opposite with variable vacant spaces, 5–15 cm. in length, interposed), ensiform or linear-lanceolate, very gradually narrowed towards the base and very long-acuminate at the summit into a subulate sparingly bristly tip, thinly papyraceous, rather firm, opaque, green and subconcolorous on both faces, slightly paler beneath, tricostate, the costae rather acute, naked or very sparingly bristly above, indistinct and smooth beneath; transverse veinlets distinct, much interrupted, not very crowded; margins smooth or with a remote adpressed spinule here and there, the lower one bordered with a very narrow shining band in the upper surface; the largest leaflets, those about the middle, 20–28 cm. long, 1–2·5 cm. broad, the lower and upper ones slightly smaller. *Male* and *female* spadix almost similar, simply decompound, flagelliform, elongate, about as long as the leaves (·6–1 m.) with very few (2–4) very remote partial inflorescences, terminating with a filiform, usually rather short and unarmed appendix; the peduncular part rather elongate, strongly flattened and armed on the edges with long acicular straight horizontal spines; primary spathes very elongate, closely sheathing, smooth, often longitudinally split, terminating in a lanceolate point, passing at their base into a long and slender axial part: this flat on the inner side, with acute margins, convex on the back, where smooth or sparingly prickly; the first spathe flattened a good deal, the edges very acute, more or less spinulous, the upper ones less flattened and usually unarmed; partial inflorescences elongate, nodding, 15–30 cm. long, inserted a little below the mouth of their own spathe, their axis slender, rigid, almost straight, with 2–6 spikelets on each side; secondary spathes 15–25 mm. long, tubular, slightly enlarged above or subclavate, very closely sheathing, unarmed, finely striately veined, very obliquely truncate, entire and naked at the mouth and prolonged at one side into a lanceolate acuminate spreading point. *Male spikelets* slender, horizontal or slightly deflexed, inserted at the mouth of their own spathes with a distinct axillary callus, 4–6 cm. long, with 15–18 perfectly bifarious flowers on each side; spathels asymmetrically infundibuliform, broad at the mouth, prolonged at one side into a triangular spreading often split point; involucre cupular, rather shallow, laterally adnate to the base of the spathel above its own, its margin truncate almost entire. *Female spikelets* larger than the male ones, 5–10 cm. long with 6–15 flowers on each side, strongly deflexed and conspicuously callous at their axilla, their axis rigid subcylindraceous; spathels shortly tubular, slightly infundibuliform, finely striately veined, truncate, entire and naked at the mouth, slightly prolonged at one side into a broad triangular point; involucrophorum laterally adnate outside its own spathel at the base of the one above, with very short subannular limb; involucre cupular, rather shallow, truncate; areola of the neuter flower very distinct, lunate, flat, callous. *Female flowers* small, conic, about 3 mm. long, horizontal, perfectly flatly bifarious, remote, about 7 mm. apart on each side. *Fruiting perianth* campanulate, slightly pedicelliform on account of the hardened and sub-callous calyx, which however is split down to the base in 3 broadly ovate almost polished acute lobes; segments of the corolla as long but narrower. *Fruit* (not quite mature) obovate, 11 mm. long, 6 mm. broad, suddenly contracted at the summit into a rather long beak; scales in 12 series, light straw-coloured with reddish-brown intramarginal line, slightly channelled along the middle, their margins finely erosely toothed. *Seed* ovoid-elliptic, smooth; albumen equable; embryo lateral.

HABITAT.—The Malayan Peninsula in the district of Perak on Gunong Tambang Batak, *Scortechini* No. 316 in Herb. Becc.; and on the Thaiping Hills, *Ridley* No. 5203 and 11413 in Herb. Becc.

OBSERVATIONS.—A very variable species, distinguished in the group with cirriferous leaves by its very narrow elongate 3-costate leaflets, which are approximate in groups of 2–6 on each side of the rachis and are not pointing different ways but are on one plane and have long vacant spaces interposed, recalling in shape and disposition those of *C. Oxleyanus.*

The specimens from the Thaiping Hills, also in the State of Perak and collected by Mr. H. N. Ridley (No. 5203) are more robust in every part than Scortechini's ones; the rachis is more strongly prickly, the leaflets as much as 6 in each group and the largest 40 cm. long, sparsely bristly-spinulous on the mid-costa above; the female spadix very elongate; upper primary spathes almost cylindraceous; spikelets up to 13 cm. long with 18 flowers on each side.

PLATE 184.—Calamus viridispinus *Becc.* Portion of the sheathed stem with an entire female spadix in flower and with an almost entire leaf (wanting the cirriferous summit); detached partial inflorescences with ovaries in course of development; detached spikelet with immature fruit; fruit; dorsal and raphal view of a seed; another seed cut through the embryo.—From Scortechini's specimen No. 316 in Herb. Becc.

NOTE.—The quite mature and somewhat bruised fruit and the seeds represented in this plate were enclosed in an envelope with Scortechini's specimen No. 316 and are supposed to belong to these. This seed is very much like that of *C. ramosissimus*, but in this the embryo is basilar.

CALAMUS VIRIDISPINUS var. SUMATRANUS Becc.

DESCRIPTION.—Petiole armed in its lower part at the margins with a few straight horizontal, 1–2 cm. long, spines; leaflets much less acuminate at the apex than in the type and sometimes almost obtuse, the tip more or less distinctly indented on its lower margin and spinulous on both sides.

HABITAT.—Sumatra, where I have found this variety on Mount Singalang in 1878.

155. CALAMUS MUCRONATUS Becc. in Rec. Bot. Surv. Ind. ii. 213.

DESCRIPTION.—Scandent, very slender. *Sheathed stem* 4–6 mm. in diam. *Leaf-sheaths* not flagelliferous, obliquely truncate at the mouth, sprinkled at first with greyish or ferrugineous scales, ultimately glabrous, finely longitudinally striate, slightly puckered above, smooth or armed with very few short broad-based solitary straight horizontal spines. *Ocrea* very short, liguliform, fugaciously ciliately setose. *Leaves* small, the pinniferous part 15–30 cm. long; the cirrus very slender, filiform, 15–40 cm. in length, armed with very crowded half-whorls of very delicate and very acute black-tipped claws, fugaciously ciliately setose; petiole very short, hardly 1 cm. long, smooth; rachis armed beneath with slender, at first solitary, upwards ternate claws, bifaced and smooth above; leaflets very few, from 3 to 9 on each side, very inequidistant and remote one from the other, irregularly alternate or subopposite, never fascicled, thinly papyraceous, rigidulous, glabrous, opaque, green even when dry, slightly paler beneath, oblanceolate, gradually tapering lower down from above the middle towards an acute base, suddenly narrowed at the summit into a rather long narrow acuminate mucro or tip, this quite naked or with 1–2 subspiny bristles at its summit, plicately 5-costulate, the costae very slender and smooth on both surfaces; transverse veinlets very fine, rather numerous, much interrupted; margins perfectly smooth; the largest leaflets, those a little above the base, 6–12 cm. long, 12–16 mm. broad; the two of the basal pair and sometimes the two next much smaller than the others, strongly deflexed and distinctly callous at their insertion. *Male spadix* slender erect, shorter than the leaves, inserted about midway of the sheaths, not flagelliferous at its summit, simply decompound, with very few (5–6) partial inflorescences; primary spathes 2–3 cm. long, tubular, slightly infundibuliform or somewhat enlarged and rather loosely sheathing in their upper part, narrowed to the base into a short unarmed axial part, fugaciously furfuraceous, very obliquely truncate and densely ciliate-bearded at the mouth, prolonged at one side into a rather long lanceolate acuminate erect point, unarmed, longitudinally striately veined; partial inflorescences inserted at the mouth of their own spathe, spreading and arched, very small, the lower ones, the largest, 4–5 cm. long with 6–8 spikelets on each side, which however have a unilateral tendency; upper inflorescences gradually smaller; secondary spathes infundibuliform, striately veined, not scabrid, rather densely covered with chaffy-furfuraceous greyish small scales, a good deal narrowed to the base, very obliquely truncate and ciliate at the mouth, prolonged at one side into a rather acute tip; spikelets very short, circinnato-scorpioid, 5–10 mm. long, with very closely packed flowers; spathels very approximate, bracteiform, concave, broadly ovate, acute or acuminate, strongly deflexed and subtending their flower; involucre transversely evolute, almost explanate and apparently formed by two triangular divaricate acute bracts connate by their bases; spathels and involucres membranous, reddish-brown, strongly striately veined and ciliate. *Male flowers* small, 2 mm. long, ovoid-subtrigonous; the calyx subcampanulate, strongly striately veined, parted midway down into 3 very broad acute lobes; the corolla about twice as long as the calyx, opaque outside. *Female spadix* . . . . .

HABITAT.—Borneo; in Sarawak, at Kuching, *Beccari* P. B. No. 829; on Mount Mattang, *Beccari* P. B. No. 1904. It was also collected by Lobb in 1853, probably also in Sarawak (H. Kew.).

OBSERVATIONS.—I have gathered two specimens with male spadices of this very distinct small *Calamus*. The one No. 1904 has quite unarmed leaf-sheaths; in the other these bear a few small straight spines.

The nearest ally of this species is perhaps *C. asperrimus*, having the male spikelets almost identical, but in this the male spadix is a good deal more elongate and besides *C. mucronatus* is not scabrid in any of its parts.

It resembles also *C. melanoloma* with which it agrees, as with *C. asperrimus*, in the small leaves with a few lanceolate leaflets, and in the green colour they keep in drying.

PLATE 185.—Calamus mucronatus *Becc.* The summit of a plant with a male spadix.—From P. B. No. 829.

156. CALAMUS ASPERRIMUS Bl. in Roem. et Schult. Syst. Veg. vii. 2, 1327; Mart Hist. Nat. Palm. iii. 212 (1st edit.) and 341; Bl. Rumphia iii. 36, t. 146; Kunth Enum. Pl. iii. 212; Walp. Ann. iii. 491 and v. 832; Miq. Fl. Ind. Bat. iii. 139, and De Palm. 28; Teysm. Cat. Hort. Bog. 74; H. Wendl. in Kerch. Les Palm. 235; Becc. in Rec. Bot. Surv. Ind. ii. 213.

DESCRIPTION.—Scandent, slender or of moderate size. *Sheathed stem* 7–20 mm. in diam. *Leaf-sheaths* slightly gibbous above, obliquely truncate at the mouth, very scabrid owing to innumerable very short subspiny rufous bulbous hairs and many very small ascendent triangular prickles and furthermore armed with a few solitary scattered horizontal or subreflexed straight broad-based subulate spines. *Ocrea* very short, liguliform, very densely covered with rigid bristles. *Leaves* of the upper part of the fertile plant cirriferous, epetiolate, about 60 cm. long in the pinniferous portion, with a filiform cirrus about as long; this very closely armed with very acute aggregate or half-whorled claws; rachis rounded beneath near its base, armed throughout along the middle with at first solitary then geminate or ternate rather robust black-tipped claws, acutely bifaced and smooth above; leaflets not very numerous, 8–10 on each side, very inequidistant, but not fascicled in distinct groups, thinly papyraceous, rather rigid, narrowly lanceolate, somewhat narrowed to and acute at the base, gradually acuminate at the summit into a subulate conspicuously bristly tip, green even when dry, opaque, slightly paler and almost silky beneath, with the mid-costa acute above where usually furnished with a few black bristles near the summit, superficial and naked beneath; side nerves slender, sometimes 2 in the upper surface more distinct than the others, smooth on both surfaces; transverse veinlets fine, sharp, approximate, continuous; margins very remotely and adpressedly spinulous, the lower one bordered in the upper surface with a narrow shining band; the largest leaflets, those near the summit, 20–30 cm. long, 1·5–2·5 cm. broad, the lower ones smaller and more spreading. *Male spadix* simply decompound, elongate, slender, flagelliform with 5–6 partial inflorescences terminating in a not very long filiform aculeolate appendix; primary spathes elongate, tubular, closely sheathing, truncate entire and densely bearded at the mouth and prolonged at one side into an erect triangular point more or less scabrid and furthermore armed with straight scattered prickles; the first flattened with acute and prickly edges; the upper ones gradually less flattened and more cylindraceous, rather suddenly narrowed at the base into a short axial part; this flat on the inner side, convex and usually not clawed on the back; partial inflorescences very slender, elongate, 20–30 cm. long, strict, inserted just at the mouth of their own spathes, with 12–15 spikelets on each side; secondary spathes infundibuliform, narrow at the base, enlarged and loose above, obliquely truncate and densely bearded at the mouth, prolonged at one side into a broadly triangular point, scabrid and finely striately veined; spikelets small circinnate-scorpioid, subtended by the point of their own spathe and inserted at the mouth of this, 15–18 mm. long, with 12–14 very closely packed flowers on each side; spathels very approximate, bracteiform, concave, broadly ovate, concave, acute or acuminate, deflexed; involucre transversely evolute, sublunate and apparently formed by two semiovate slightly falcate bracts—connate by their bases; spathels and involucra membranous, reddish-brown, strongly striately veined, ciliate and sprinkled with small rusty subhairy scales. *Male flowers* 4 mm. long, oblong; the calyx parted to about midway down into 3 broadly triangular acute distinctly bordered lobes, strongly striately veined; the segments of the corolla twice as long as the calyx, opaque and finely striate outside. *Female spadix* simply decompound, about 1·8 m. long (*Blume*), nodding, slender, with 7–9 partial inflorescences and terminating in a rather elongate aculeolate filiform appendix; primary spathes . . . . . ; partial inflorescences elongate with straight slender axis, the one seen by me 40 cm. long with 13 distichous spikelets in all; secondary spathes tubular, slightly infundibuliform, 2·5–3 cm. long, obliquely truncate and densely bearded at the mouth, scabrid; spikelets inserted just at the mouth of their own spathe, horizontal, slightly arched, the lower ones, the largest, about 4 cm. long, with 8–10 distichous very approximate flowers on each side; the upper ones somewhat shorter; spathels very closely packed, subperfoliate or with a very short tubular part, suddenly expanded into a very broad concave bracteiform obtuse deflexed limb; involucrophorum and involucre subconform, bracteiform, concave, unilaterally evolute in contrary directions; spathels and involucra strongly striately veined and glabrous inside, densely ciliate and covered outside with rusty-paleaceous hairs; areola of the neuter flower depressed, linear, hidden under the involucrum. *Female flowers* about 4 mm. long, almost horizontally inserted; the calyx subcoriaceous, striately veined outside, parted to midway down into 3 very broad semiovate rather obtuse distinctly bordered lobes; segments of the corolla narrower but as long as the lobes of the calyx. *Fruiting perianth* apparently not or very shortly pedicelliform. *Fruit* (very young) ovoid, tapering to a stout conic beak; scales shining, in 18–20 series, reddish-brown at the summit, this not fringed an' erosely toothed at the margins.

HABITAT.—On the volcanic mountains of Java, such as the Megamendong, Pangherango, Gedé, etc., *Blume.*—Javan name: "Huy Lulus" or "H. Leles"; Malayan name: "Rotang Lumus."

OBSERVATIONS.—Blume founded this species only on specimens of the female plant with spadices bearing very young fruit. Of Blume's specimens I have seen some portions of which I availed myself in the description above. Furthermore I have recognized this species in some fine cultivated male specimens forwarded to me from Buitenzorg by Dr. Treub and in others (also with male spadices) sent by Teysmann to the St. Petersburg Herbarium. These last have a leaf with a very long cirrus, the leaflets are 11 on each side, of which the largest is 25 cm. long and 27 mm. broad; some of them are subtricostulate, having on each side of the mid-costa one secondary nerve slightly stronger than the others. The sheathed stem in Blume's specimen is 2 cm. in diam. and in the cultivated male specimens is a good deal more slender (6–12 mm.). In these the leaves of the lower part of the plant are not cirriferous, have 28–30 leaflets in all, with the two of the terminal pair free at the base; the leaves of the intermediate portion have a very slender and rudimentary cirrus at their summit, and the uppermost are conspicuously cirriferous; these last have 9–10 couplets of leaflets 15–20 cm. long and 15–18 mm. broad.

Very distinct by its scabrid sheaths and spathes, the epetiolate leaves and the small circinnate-scorpioid spikelets.

PLATE 186.—Calamus asperrimus *Bl.* The summit of a plant with a cirriferous leaf; a non-cirriferous leaf with its sheath from the lower part of the same plant; the ummit of a male spadix.—From a specimen cultivated at Buitenzorg in Herb. Becc.

157. CALAMUS ERIOACANTHUS Becc. Nelle Foreste di Borneo, 610 and in Rec. Bot. Surv. Ind. ii, 213.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 7–12 mm. in diam. *Leaf-sheaths* gibbous above, rusty-furfuraceous, at first rather densely covered with rather short and broad spines, of which the largest about 1 cm. long, slightly deflexed, broad, light-coloured and convex above and concave beneath at their base, their point greenish and copiously fringed-furfuraceous at the margins; further the sheaths are more or less marked with small transverse interrupted raised ridges, which are also more or less fringed on their crest. *Ocrea* very elongate, fibrous-retiform, in one specimen 13 cm. long, ultimately quite deciduous. *Leaf-sheath flagella* very rudimentary, 3–5·5 cm. long, very slender. *Leaves* cirriferous, 40–70 cm. long in the pinniferous part; the cirrus about as long as the pinniferous part in the leaves of the upper part of the plant, slender, closely but rather irregularly armed with solitary or more or less aggregate not very large claws; petiole rather short, 6–14 cm. long, slightly channelled or flattish above, acute and smooth at the margins, rounded beneath, where very sparingly and sparsely prickly; rachis irregularly armed beneath with solitary, small, scattered claws, which become more or less aggregate only near the base of the cirrus, acutely bifaced and smooth above; leaflets very few, 13–14 in all, very inequidistant, grouped in 4 remote fascicles; usually approximate in pairs on each side, the pairs opposite, thinly papyraceous, rather firm, 18–25 cm. long, 2·5–5 cm. broad, the intermediate ones slightly the largest, green and subconcolorous on both surfaces, shining above, opaque beneath, lanceolate or oblanceolate, almost flat or very slightly concavo-convex, usually broadest above the middle, suddenly contracted near the summit into a short acuminate bristly tip, gradually narrowed towards the base, rather acutely 3-costulate and with other slender but rather distinct secondary nerves interposed; the mid-costa not stronger than side ones; all nerves smooth on both surfaces; transverse veinlets fine and rather approximate; margins quite smooth.

HABITAT.—Borneo in Sarawak on Mt. Mattang (*Beccari* P. B. Nos. 1919 and 1934). Malay name in Sarawak "Rotang Baroh."

OBSERVATIONS.—I have collected two sterile specimens of this, which seems related to *C. optimus.* One of the specimens, No. 1934, is more robust than the other, its sheathed stem is 12 mm. in diam. and the largest of its leaflets are 25 cm. long and 5 cm. broad; in the other the leaf-sheaths are 7 mm. in diam. and the largest leaflets 18 cm. long, 3 cm. broad.

This also keeps its green colour in herbarium specimens.

PLATE 187.—Calamus erioacanthus *Becc.*—An intermediate portion of a sheathed stem with an entire leaf.—From P. B. No. 1934.

158. CALAMUS OPTIMUS Becc. Nelle Foreste di Borneo, 610, and in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—Slender, high scandent, glabrescent in every part. *Sheathed stem* 12–15 mm. in diam. *Leaf-sheaths* gibbous above, armed with large, solitary, scattered, deflexed, laminar, robust, almost claw-shaped spines, of which the largest 2·5 cm. in length, and with a very broad, deeply underneath excavate and above tumescent base. *Leaves* cirriferous, comparatively short, 70–80 cm. long in the pinniferous portion; the cirrus itself sometimes even a metre in length, armed at very regular and gradually shorter intervals with half-whorls of rather robust light-based and black-tipped claws; petiole rather short (6–12 cm. long), broadly channelled above, rounded beneath, where armed along the middle and near the margins with a few strong scattered claws; rachis in the pinniferous part bifaced above, strongly armed beneath like the terminal cirrus; leaflets very few, 6–8 in all, solitary and very distant on each side, lower ones subopposite, oblanceolate or oblong-lanceolate or sub-spathulate, somewhat concavo-convex, green above, whitish or very sparingly mealy beneath especially in young leaves, with 4–6 acute rather slender costae, which are naked on both surfaces, long and gradually narrowed towards the base, very suddenly contracted at the summit into a short triangular, laterally bristly-spinulous tip; transverse veinlets very slender, excessively numerous, very close together and very continuous, especially sharp in the upper surface, but visible also underneath; margins appressedly and remotely spinulous, the lower one bordered on the upper side with a polished band, a few others usually occur also in the middle of the blade; the largest leaflets, the intermediate, 32–35 cm. long and 5·5–6 cm. broad, the upper and lower ones slightly smaller. In one specimen a radical leaf is very large with a petiole 1·2 m. in length, terete and armed in its lower portion with long, strong and horizontal spines, and only with a large terminal flabellum which is 85 cm. long, parted from a little above the base into two oblong lobes; these 12–13 cm. broad and with 7 robust and acute costae.

HABITAT.—Borneo at Kuching near Sarawak, *Beccari* P. B. Nos. 1907 and 1917. Malay name in Sarawak " Rotang Segah " and " R. Buluch."

OBSERVATIONS.—A very near ally of *C. cœsius*, but distinct by the sheaths armed with much larger spines, by the longer petioles and chiefly by the leaflets solitary, very distant, not geminate on each side of the rachis and not distinctly covered with a mealy glaucous crustaceous indumentum. The canes slender, very tough and elastic, with a yellow glossy vitreous surface, are very much esteemed in commerce. In Sarawak it is considered as the best Rotang produced in the country, where however it is now becoming scarce.

PLATE 188.—Calamus optimus *Becc.*—Portion of a sheathed tem,—(from P. B. No. 1917); an entire leaf with the upper portion of its sheath; from P. B. No. 1907.

159. **Calamus cæsius** Bl. Rumphia iii, 57; Mart. Hist. Nat. Palm. iii, 340; Walp. Ann. iii, 490 and v, 832; Miq. Anal. Bot. Ind. i, 6 and Fl. Ind. Bat. iii, 129 and De Palmis, 28; Teysm. Cat. Hort. Bogor. 74; H. Wendl. in Kerch. Palm. 235; Hook. f. Fl. Brit. Ind. vi, 456; Becc. in Rec. Bot. Surv. Ind. ii, 211.

C. glaucescens Bl. Rumphia iii, 65; Mart. Hist. Nat. Palm iii, 339; Walp. Ann. iii, 489 and v, 831; Miq. Anal. Bot. Ind. i, 6 and Fl. Ind. Bat. iii, 129 and De Palmis, 27.

Description.—Rather slender, high scandent. *Sheathed stem* 13–18 mm. in diam. *Leaf-sheaths* (non-flagelliferous) very obliquely truncate at the mouth, strongly gibbous above, the youngest marbled with green and white-mealy patches and more or less furfuraceous, the adult ones yellowish green (when dry) more or less distinctly longitudinally striate, armed with strong scattered, solitary, straight subulate, horizontal or slightly deflexed, slightly curved or almost claw-shaped large spines, 1–2 cm. long which have a base extraordinarily broad, callous, swollen above and concave beneath; sometimes with the larger spines near the summit of the sheath are intermingled others smaller, tuberculiform and ascendant; in youth all are cottony-furfuraceous at the margins. *Ocrea* very short, reduced to a small obtuse ligula and to a narrow naked rim at the mouth of the sheath. *Leaves* cirriferous, the pinniferous part 60–80 cm. long; petiole very short or almost wanting; rachis smooth above, where flat near the base but speedily acutely bifaced, slightly convex underneath, where in its lower portion armed along the middle and at the sides with solitary scattered light-based black-tipped claws; these are 3-nate and higher up half-whorled, the half-whorls very regularly set at gradually shorter intervals on the cirrus; the cirrus itself about 1 metre in length; leaflets few, 16–24 in all, very irregularly set, usually approximate in pairs on each side, the pairs 15–20 cm. apart, those of one side usually alternating with those of the other side or sometimes sub-opposite, more or less concavo-convex, oblong-lanceolate, gradually tapering towards the base, which is acute, acuminate into a short spinulous apex, papyraceous, rigidulous, conspicuously discolorous (chiefly in recently expanded leaves), sub-shining, green and glabrous above, conspicuously mealy-glaucous beneath, acutely 4–5-costulate with some other distinct secondary nerves interposed, all naked on both surfaces and very faint beneath; transverse veinlets very fine, very numerous and approximate on the upper surface, obliterate beneath; margins minutely and closely spinulous upwards, more remotely near the base; the lower margin bordered on the upper surface with a distinct shining stripe, similar stripes occurring also on the blade, chiefly near its summit; the largest leaflets, those of the middle, 30–35 cm. long, 5–6 cm. broad; the lower ones much narrower and more distinctly callous at their insertion; the upper ones shorter but not much narrower.—Other parts unknown.

Habitat.—South Borneo, according to Blume, where the sterile specimens upon which the species was founded were collected by Henrici.

I have referred to this species one specimen (also sterile) collected by Scortechini in the district of Perak in the Malayan Peninsula (No. 456 in Herb. Becc.), where it is called by the natives "Rotang Saga Boeh" and a portion of a leaf and some detached fruits collected in the State of Johore by Mr. Pears, who assigns to it the name of "Rotang Segar" (*Ridley* No. 10716 in Herb. Kew). A portion of a fruit-spadix without leaves, apparently not differing from the above, is also preserved in the Calcutta Herb. with the label "Ridley No. 11382: Batu Pahat, State of Johore: Rotang Segar." Henrici gives the Bornean names of "Ujanjang" and "Rotang Latong," adding that its canes are much valued by the Malays.

Observations.—I have seen of this a portion of a leaf from the authentic specimen described by Blume, which has afforded me the means of recognising beyond a doubt this species in some large sterile but otherwise complete specimens, obtained from plants cultivated in the Buitenzorg Gardens and kindly forwarded to me by Dr. M. Treub. Scortechini's specimen is also sterile, but agrees pretty well with the type specimen of Blume. The sheathed stem of this is however more slender (10–12 mm. in diam.) than in the cultivated specimens of which I have made use for the description above and the leaf-sheaths are armed with longer spines. Scortechini in a note added to his specimen says that the internodes are 25–30 cm. long and the leaflets silvery-pale beneath. *C. cœsius* is well characterised by its underneath glaucous, remotely geminate, not numerous oblanceolate 5-costulate leaflets.

It is certainly a near ally of *C. simplex* in which, however, the leaflets are not mealy-glaucous beneath.

The very incomplete specimen from the State of Johore preserved at Kew (Ridley No. 10716 with the native name of Rotang Segar) is identical with that of Scortechini No. 454 and it is accompanied with some almost mature detached fruits. These are ellipsoid-ovoid, very suddenly narrowed into a rather long and not very thick beak, 18 mm. long including the beak and the fruiting pedicelliform perianth, 12 mm. broad; scales in 18 longitudinal series, polished yellowish-straw-coloured, convex, very narrowly and deeply channelled along the middle with a small triangular acute point and an almost concolorous erosely toothed margin; seed ovoid, rounded to both ends, 10–11 mm. long, 8 mm. broad, minutely pitted on the surface, the chalazal fovea, round, small, not very distinct; albumen not very deeply ruminate; embryo lateral near the base.

Ridley's No. 11382 of the Calcutta Herb. consists only of a partial inflorescence 55 cm. long with 6 spikelets on each side; in this specimen the secondary spathes are tubular, very slightly enlarged in their upper part, closely sheathing, unarmed, truncate and entire at the mouth, very shortly apiculate at one side. The spikelets are vermicular, rigid, inserted outside the mouth of their respective spathes with a rather distinct axillary callus, the lower ones 10–12 cm. long, with 10–12 flowers on each side, the upper ones shorter; the spathels are infundibuliform, truncate and entire, extended on the outer side into a very short and broad triangular point, the involucrophorum is exert from its own spathel and laterally attached to the base of the one above, very shortly cupular, bidentate on the side next to the axis, the involucre very shallowly cupular, very slightly exceeding the involucrophorum. The fruit is as described above.

PLATE 188A.—Calamus cæsius *Bl.* (Under the name of *Calamus optimus* Becc). Portion of the sheathed stem with the base of a leaf; summit of a leaf,—from Scortechini's No. 456 in Herb. Becc.; portion of a fruiting spadix,—from Ridley's No. 11382 in Herb. Calc.; detached fruits and seeds, one of these cut longitudinally through the embryo,—from Ridley's No. 10716 in Herb. Kew.

PLATE 189.—Calamus cæsius *Bl.* Portion of a sheathed stem; portion of a leaf from near its base and seen from the lower surface; the summit of a leaf from a specimen in Herb. Becc. gathered from a plant cultivated at Buitenzorg.

160. CALAMUS SIMPLEX Becc. in Hook. f. Fl. Brit. Ind. vi, 456, and in Rec. Bot. Surv. Ind. ii. 211.

DESCRIPTION.—Rather slender, scandent. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* not flagelliferous, very obliquely truncate at the mouth, gibbous above, covered at the different parts of the spadix with a crustaceous more or less permanent rusty-furfuraceous indumentum, strongly armed with unequal, elastic, laminar, lanceolate, shining, yellowish or schistaceous-brown, horizontal or slightly deflexed spines, of which the largest up to 2 cm. long, their base 5 mm. broad, slightly concave beneath and strongly callous above. *Ocrea* marcescent, brittle and deciduous. *Leaves* 80 cm. to 1·5 m. long in the pinniferous part, with very few very large leaflets, terminating in a rather long but delicate cirrus, which is armed at regular intervals with rather strong gradually diminishing almost always ternate claws; petiole rather robust, 15–20 cm. long, flat above, convex beneath, in vigorous plants 1 cm. broad, armed on the acute margins with a few strong horizontal spines; rachis bifaced and smooth above, flattish beneath where armed at the sides, in its lower portion, with a few strong claws, these ternate in its upper part; leaflets very few about 10 in all, papyraceous, rigid, solitary, very remote or with long vacant spaces amongst them, more or less concavo-convex, sub-opposite or at great distances (even 30 cm.) alternate, lanceolate or elliptic-lanceolate, almost equally narrowed to both ends, acute at the base, very shortly acuminate at the summit, green above, slightly paler beneath, with 5–6 acute costae, these quite smooth on both surfaces; transverse veinlets not very conspicuous; margins quite smooth, the lower one often bordered on the upper surface with a polished band, other similar bands sometimes occurring on the blade alongside the costae; the largest leaflets up to 60 cm. long and 10 cm. broad, in less vigorous specimens 30 by 5–6·5 cm., the lower ones usually the largest; the uppermost slightly shorter. *Male spadix* very simple, elongate, in one specimen 85 cm. long with 9 alternate spikelets in all, only the lowest of these with a secondary spikelet at its base, otherwise simply decompound like the female spadix; primary spathes tubular, elongate, slightly loosely sheathing and slightly flattened truncate and entire at the mouth, prolonged at one side into a short triangular acutely keeled point, sprinkled with very few scattered prickles, narrowed a good deal towards the base into a slender much flattened unarmed axial portion; the lowest primary spathe not differing from the upper ones, only more elongate and with a longer flattened part at the base; spikelets inserted a little above the mouth of their own spathe and slightly callous at their axilla, spreading, arched, flexuous, flattened, zig-zag sinuous between the flowers, 12–13 cm. long, with 15–16 rather remote flatly bifarious flowers on each side; spathels infundibuliform, truncate, entire at the mouth, shortly apiculate at one side, more or less sprinkled with tobacco-brown scales; involucre cupular, rather deep, laterally attached at the base of the spathel above its own, anticously truncate. *Female spadix* very simple, a good deal like the male one, but shorter, with only 2–3 spikelets on each side, shorter than the leaves (40–50 cm. long) more or less covered with a rusty-furfuraceous indumentum, erect, quite unarmed, or nearly so, terminating in a small flattened tail-like smooth or sparingly spinulous appendix; primary spathes as in the male spadix, 4–6 cm. long in the somewhat flattened sheathing part, suddenly narrowed at the base into a flattened and unarmed axial portion; the first longer than the others, more elongate and more flattened and two-edged in the basal part; the edges smooth or sparingly spinulous; spikelets inserted just outside the mouth of their own spathe, rather thick, spreading, arched, slightly callous at the axilla; the larger ones, the lowest, 6–7 cm. long with few (5–6) flowers on each side; the two series not exactly in one plane but slightly assurgent; spathels infundibuliform, truncate, somewhat irregular by the pressure of the flowers, acute at one side; involucrophorum very short, subcupular, laterally attached to the base of the spathel above its own and subtended by this with a distinct axillary callus next to the axis; involucre cupular, short, almost entire; barely exceeding the involucrophorum; areola of the neuter flower depressedly lunate, somewhat irregular and tumescent. *Fruiting perianth* pedicelliform, rather thick and very short or somewhat depressed; the calyx callous at the base, divided to about midway down into 3 large ovate lobes; the segments of the corolla smaller and as long as the calyx. *Fruit* large, about 3 cm. long and 2 cm. broad, globose-ovoid, broadly and equally rounded at both ends, with a short caudiculum at the base and suddenly topped by a conic, about 3 mm. long, mucro; scales in 21 series, flattish, slightly channelled along the middle, yellowish-brown near their base, darkening towards the point, with a narrow, almost black, marginal line, their margins finely erosely-toothed, the point short, usually rather obtuse, not very adpressed. *Seed* globular, about 15 mm. in diam., covered by a very adherent crustaceous integument, minutely pitted and finely tubercled on the surface; the chalazal fovea inconspicuous, circular, very small, situated near the summit of the raphal side; albumen very deeply ruminate; embryo almost basal.

HABITAT.—The Malayan Peninsula in the district of Perak on Gunong Tambang Batak, elev. about 1,900 m., collected by the Rev. Father Scortechini (No. 432^b in Herb. Becc.)

OBSERVATIONS.—A very distinct species by its ♂ and ♀ very simple similar spadices; the leaves with few very large leaflets, and the very large, globular fruit, in this last detail being only second to *C. erectus.* The male specimen has a more slender stem and smaller leaflets than the female one. It appears related to *C. cæsius* and *C. optimus.*

PLATE 190.—Calamus simplex *Becc.* Portion of a sheathed stem with an entire fruit-spadix and the base of a leaf; the summit of a leaf; mature fruit; seed, entire and longitudinally cut through the embryo.—From Scortechini's type specimen in Herb. Becc.

161. CALAMUS DORIÆI Becc. in Hook. f. Fl. Brit. Ind., vi, 456, and in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—*Stem* . . . . *Leaves* . . . . *Female spadix* diffuse, apparently noncirriferous (not seen entire); primary spathes . . . .; partial inflorescences with rigid arched axis and terminating in a slender barely spinulous tail-like appendix; the largest seen by me 30 cm. long with 6 spikelets on each side; secondary spathes tubular, slightly infundibuliform, closely sheathing, unarmed, 2 cm. long, truncate and naked at the mouth where extended at one side into a rather long, acute, patent or deflexed point; spikelets inserted just above the mouth of their own spathe with a small axillary callus, horizontal or deflexed, slightly arched, zig-zag-sinuous, the larger ones, the lowest, 6 cm. long with 7–9 horizontal flowers on each side, the uppermost shorter with 5–6 flowers in all; spathels infundibuliform, narrow at the base, horizontally truncate and entire at the mouth, extended at one side into a broadly triangular acute point; involucrophorum subtended by the point of its own spathel and laterally attached at the base of the one above, shortly cupular, two-keeled and bidentate on the side next to the axis; involucre cupular, its margin entire, undulate; areola of the neuter flower depressedly lunate, sharply bordered. *Fruiting perianth* distinctly pedicelliform, its indurated calyx depressedly ventricose with 3 broad, triangular acute lobes; the segments of the corolla slightly longer but narrower than the lobes of the calyx, both patent under the fruit. *Fruit* elongate-elliptic, 22–25 mm. long, 11–12 mm. broad, equally rounded at both ends, topped by a stout cylindric, 2 mm. long beak, with a small caudiculum at the base which penetrates into the perianth; scales small, in about 21 series, shining, yellowish, brown only on the short tip, narrowly and deeply channelled along the middle, margins finely erosely toothed. *Seed* oblong, subcylindraceous, its surface pitted; the chalazal fovea indistinct; albumen superficially ruminate; embryo sub-basilar, slightly shifted on one side.

HABITAT.—Burma; discovered in March 1888 by my lamented friend Sig. Leonardo Fea at Tahò on the Karin Gheccu mountains.

OBSERVATIONS.—The materials from which the description above is derived consist only of two detached partial inflorescences with mature fruit.

It seems related to *C. inermis* and *C. khasianus*, but is abundantly distinct by its smaller elongate fruit.—See observations under *C. polydesmus*.

PLATE 191.—Calamus Doriæi *Becc.* The two partial inflorescences (in Herb. Becc.) upon which the species has been founded.

162. CALAMUS POLYDESMUS BECC. sp. n.

DESCRIPTION.—Scandent, apparently rather robust. *Leaf-sheaths* . . . . *Leaves* apparently cirriferous, but their summit not seen by me; in the intermediate portion the rachis is rather robust, not very acutely angular, bifaced above, and obsoletely angular-convex beneath, where armed with very robust claws, which are solitary lower down and geminate upwards; leaflets very distinctly grouped in fascicles of 2–3, papyraceous, glabrous, light green (when dry) and concolorous on both surfaces, linear-lanceolate, gradually acuminate to the summit, 20–22 cm. long, 18–25 mm. broad, sub-5-costulate, the mid-costa rather acute and the side nerves slender, all naked on both surfaces; margins spinulous-serrulate; in each fascicle the leaflets are very approximate by their base and divergent or pointing different ways. *Male spadix* . . . . *Female spadix* apparently non-cirriferous (not seen entire by me); primary spathes tubular, slightly enlarged above, not very elongate (those seen by me 5–6 cm. long) rather closely sheathing, channelled near the base on the inner side, entire at the mouth, prolonged at the summit into a rather elongate triangular point, faintly keeled and with a few prickles on the back near their summit; partial inflorescences inserted above the mouth of their own spathe with 3–4 spikelets on each side; secondary spathes tubular, slightly infundibuliform, smooth, 12–15 mm. long, entire and truncate at the mouth, prolonged at one side into a triangular point; spikelets inserted outside the mouth of their respective spathe with a distinct axillary callus; spathels infundibuliform, truncate and entire at the mouth, extended at one side into a very short broadly triangular point; involucrophorum exsert from its own spathe and laterally attached at the base of that above its own, shortly cupular, two-keeled and bidentate on the side next to the axis; involucre slightly exceeding the involucrophorum, cupular, its margin undulate; areola of the neuter flower lunate, sharply bordered. *Fruiting perianth* distinctly pedicelliform, indurated, cylindraceous. *Fruit* . . . .

HABITAT.—Central Burma, at Byinkyé (alt. 1,200 m.) discovered by *Mr. W. H. Craddock* (Herb. Calc.). The label bears also the following indications:—"A cane 3″–9″ girth. Fruit 9. 3. 02."

OBSERVATIONS.—Of this species I have seen only an intermediate portion of a leaf, a portion of a young female spadix, and a spikelet, detached from a fruit spadix, but with only a fruiting perianth left attached to it. This spikelet is 10 cm. long and bears distichously 9 flowers on each side; the spikelets of the young spadix bear 5–6 flowers only on each side.

The structure of the female spikelet is very similar to that met with in *C. Doriæi* but of this the leaves are unknown and as the specimen of *C. polydesmus* is without fruit, it is difficult to compare the two. It may indeed transpire that the two are not distinct specifically when both become better known.

PLATE 191A.—Calamus polydesmus *Becc.* Portion from near the summit of a young female spadix; spikelet from a fruit-spadix with only a fruiting perianth still attached to it; an intermediate portion of a leaf; these parts constitute Mr. Craddock's entire type specimen in Herb. Calc.

163. CALAMUS KHASIANUS Becc. sp. n.

DESCRIPTION.—High scandent and very robust. *Sheathed stem* 5 cm. in diam.; naked canes 2·5–3 cm.; the internodes about 25 cm. long. *Leaf-sheaths* light-coloured when dry, almost polished, not or indistinctly longitudinally striate, strongly gibbous above, obliquely truncate at the mouth, more or less armed mainly on the back with very large, scattered or slightly confluent (not in whorls), altogether light-coloured, laminar, very broad, lanceolate, 2–3 cm. long spines, which leave impressed their outline on the sheaths, and have a base up to 2 cm. broad, concave beneath and tumescent above. *Ocrea* very short, consisting of a small axillary glabrous naked ligula and a narrow margin to the mouth of the sheath. *Leaves* very large, very similar to those of *C. inermis* as to the distribution of the leaflets and the general dimensions, terminating in a robust cirrus, which is armed with robust half-whorled or scattered claws; petiole of the leaves of the upper part of the fertile plant very short, very stout, even 3 cm. broad, flattish above, more or less prickly at the margins, rounded beneath, where naked or with a few strong claws; rachis in its first portion similar to the petiole, upwards very obsoletely angular above, roundish beneath, where strongly armed at first with solitary and then ternate claws; leaflets papyraceous, rigid, green even when dry, slightly paler beneath than above, glabrous, usually in pairs or even 3–4 approximate on each side of the rachis with long (15–20 cm.) vacant spaces interposed (the groups of one side alternate with or subopposite to those of the other side) very narrowly lanceolate or lanceolate-ensiform, 40–50 cm. long, 2·5–3·5 cm. broad, narrowed towards the base, slightly callous at their insertion, gradually acuminate into a bristly penicillate tip, 3- and sometimes sub-5-costulate; the costae slender, the mid-one, the strongest, usually naked like the other two or all very sparingly spinulous above, always naked beneath; transverse veinlets rather distinct, close together and continuous; margins finely and adpressedly spinulous, upper leaflets usually solitary, broader and shorter and more distinctly lanceolate or oblanceolate than the lower ones. *Male spadix* . . . . *Female spadix* simply decompound, rather robust and diffuse, spreading and arched, 1·2–1·5 m. long, with many partial inflorescences; primary spathes coriaceous, tubular, closely sheathing, short, 10–15 cm. long; the lowest considerably flattened, acutely two-edged and more or less prickly at the sides, truncate at the mouth; the upper ones more cylindraceous, slightly narrowed towards the base or very narrowly infundibuliform, truncate at the mouth and prolonged at one side into a triangular dorsally keeled point, more or less densely aculeolate in their upper part; partial inflorescences arched, very spreading or deflexed, terminating in a small tail-like, rigid, prickly appendix; some of the lower inflorescences attached inside their respective spathes and not callous at the axilla, but the others exsert and callous at the axilla; the lower ones, the largest, up to 70–80 cm. long, with 8–9 spikelets on each side, the upper ones somewhat shorter; secondary spathes almost polished, tubular-infundibuliform, 3–6 cm. long, thinly coriaceous, truncate at the mouth, entire, prolonged at one side into a short triangular point with a few scattered prickles on the back; spikelets inserted at the mouth of their respective spathes, with a rather distinct axillary callus, arched, spreading, horizontal or even recurved; the larger ones, the lowest, even 20 cm. long, with 15–16 flowers on each side, the uppermost about half as long, robust, tough, zig-zag-sinuous; spathels symmetrically infundibuliform, somewhat attenuate at the base (not subventricose), horizontally truncate and entire at the mouth, distinctly apiculate at one side, almost polished, more or less scaly-furfuraceous; involucrophorum laterally attached at the base of the spathel above its own, without a distinct axillary callus next to the axis, shallowly cupular, flat, two-keeled, bidentate and with the margin slightly excavate on the side next the axis; involucre moulded on the involucrophorum, cupular, shallow, with nearly entire margin, areola of the neuter flower lunate. *Fruiting perianth* distinctly pedicelliform; the calyx with callous cylindraceous or subventricose tube and short teeth; the segments of the corolla somewhat narrower than the teeth of the calyx and as long as these. *Fruit* (quite mature) globose, almost sphæric, very suddenly mucronate and with a short caudiculum at the base which enters into the perianth, 26–27 mm. long including the mucro and the caudiculum and 2 cm. in diam.; scales in 18 series, shining, deeply and narrowly channelled along the middle, yellowish, with a narrow intramarginal brown line more extended towards the small triangular point, margin very narrow, finely erose. *Seed* globular, about 15 mm. long, 13 mm. broad, strongly and coarsely pitted on the entire surface, with a narrow longitudinal furrow on the raphal side parting from the central indistinct punctiform chalazal fovea; albumen superficially ruminate; embryo basal.

HABITAT.—I consider as type specimens of this species those that Mr. G. Mann collected with mature fruit in June 1888 in the Khasia Hills and which were kindly forwarded to me. I have little doubt, however, that the specimens collected by Sir J. D. Hooker and Dr. T. Thomson in August 1850 with immature fruit at Churra and Nowgong in the Ladder Valley, also in the Khasia Hills, must be referred to *C. khasianus*, as also some other sterile specimens from Tura (Garo Hills) and Lakkat (700 m.) collected by Mr. C. B. Clarke. A note by Clarke appended to specimens from Lakkat (probably detached from a young not yet fertile plant) declares these to belong to a tree 15 feet high and quite erect with spiral rows of prickles in many series up the stem; the fronds 1-pinnate. Another note to the specimen from Tura says:—"Tenga. Fruit edible. The same rottang cultivated below Nonghedem."

OBSERVATIONS.—I have been long hesitating whether I ought to consider this *Calamus* as distinct specifically from *C. inermis* or as only a variety of it. And indeed the name *inermis* is a very inappropriate one for *C. khasianus*, which sometimes, especially in young plants, has the leaf-sheaths armed with formidable spines. This character would not have been, however, sufficient for basing upon it alone a new species of *Calamus*; but *C. khasianus* differs further from *C. inermis* in its diffuse and not strict spadices with larger spreading partial inflorescences inserted outside their own spathes often with a distinct axillary callus; in the spikelets also spreading, arched and callous at their insertion; in the not subventricose spathels and in the sphæric not elliptic fruit, in the globose seed and in the fruiting perianth not distinctly ventricose. Nevertheless the affinities of *C. khasianus* with *C. inermis* are so great, that probably the first is only a local form of the second, and it is not impossible that intermediate forms may occur, though, as Griffith has already pointed out (Griff. Palms, p. 108), "the plants of Khasia Hills are generally distinct from those of the Himalayas." The young plants of *C. khasianus* seem to be erect and with non-cirriferous leaves.

PLATE 192.—Calamus khasianus *Becc.* Portion of the sheathed stem; an intermediate portion of a leaf (under-surface); partial inflorescence with mature fruit; detached fruits and seeds, one of these longitudinally cut.—From Mann's specimens in Herb. Becc.

164. CALAMUS NAMBARIENSIS Becc. sp. n.

DESCRIPTION.—Scandent, rather robust. *Sheathed stem* 3–4 cm. in diam. *Leaf-sheaths* of a light-cinnamon colour when dry, glabrescent or lightly scaly-furfuraceous, strongly gibbous above, obliquely truncate at the mouth, armed all round with large, laminar, broad, triangular-lanceolate, solitary 2–3 cm. long, more or less confluent, transversely subseriate, horizontal or slightly deflexed spines, which are about the same colour as the surface of the sheath or with the point slightly darker and have a very broad and concavo-convex base; the spaces between these large spines are covered with much smaller ones, and these are triangular, ascendant, 1–5 mm. long. *Ocrea* very small, consisting of a short axillary, naked ligula and a narrow rim at the mouth of the sheath. *Leaves* very large, about 3 metres in length in the pinniferous part, terminating in a rather robust cirrus, which is another metre in length and is armed with half or three-fourths-whorls of light-based and black-tipped claws; petiole very short (in leaves of the upper part of the adult plant), rounded beneath where unarmed or nearly so, and flat above where more or less prickly on the surface as at the side; rachis biconvex shortly beyond its base, sparsely spinulous there above and naked beneath along the middle, armed with a few strong claws at the sides especially under the insertion of the leaflets; in its upper part obsoletely angular and smooth above and armed beneath along the middle at first with solitary, then 3-nate and finally half-whorled claws; leaflets rather numerous (about 30 on each side), very spreading or subhorizontal with a rather distinct axillary callus at their insertion, remotely subequidistant from the base up to the summit, the intervals between the leaflets varying from 12–15 cm. in the upper third part of the leaf and from 6-10 cm. in the remainder, papyraceous, glabrous, green, very slightly paler beneath than above where subshining, very narrowly lanceolate or lanceolate-ensiform, very gradually acuminate into a slightly bristly tip, 3- or sometimes sub-5-costulate; the costæ naked on both surfaces, slender; the mid-one slightly stronger than the others; transverse veinlets rather prominent and crowded; the margins very indistinctly and very adpressedly spinulous; the lower one bordered with a shining band in the upper surface; the largest leaflets, those a little above the base, up to 50 cm. long and 4 cm. broad, the lowest and the uppermost shorter and 2·5–3 cm. broad. *Male spadix* simply decompound or partially supradecompound, viz., with the lower inflorescences branched again, 1–1·2 m. in length, rather lax, arched, spreading, with 5–7 partial inflorescences on each side; primary spathes thinly coriaceous, the first very short, 5–6 cm. long, flattened, more or less prickly, acutely two-edged, truncate at the mouth, terminating in a triangular dorsally acutely keeled point; the upper primary spathes tubular, closely sheathing, slightly enlarged in their upper part or narrowly tubular-infundibuliform, finely longitudinally striate, otherwise almost polished, armed especially in their upper part with short scattered horizontal or slightly deflexed prickles, more or less obliquely truncate and entire at the mouth, prolonged at one side into a triangular dorsally keeled point; partial inflorescences attached inside the mouth of their respective spathe or in every case arising erect from these without an axillary callus, then arched and spreading; lower partial inflorescences 30–45 cm. in length, with 8–10 spikelets on each side, of which those nearer to the base sometimes branched; upper inflorescences shorter; secondary spathes tubular-infundibuliform, unarmed or with a straggling spinule, finely striately veined, entire and more or less obliquely truncate at the mouth, prolonged at one side into a triangular acute or acuminate point; spikelets attached at the mouth of their respective spathe with a rather distinct axillary callus, more or less arched, spreading or even deflexed; the lower ones, the largest, 3–4 cm. long with 14–18 very closely set flowers on each side, those of the summit one-half as long; spathels very closely packed, imbricate, bracteiform, concave, broadly ovate, finely striately veined, scaly-ciliolate at the margin, prolonged into a point which subtends the base of the flower and after the fall of this projects beyond the involucre, this dimidiately cupular, acutely bidentate, two-keeled and deeply excavate on the side next to the axis, the keels very sharp and ciliolate. *Male flowers* small, 3 mm. long, rather obtuse or apiculate; the calyx with a short, veined tube, its teeth as long as the tube, broad at the base and with an acuminate point; the corolla about twice as long as the calyx, the segments finely longitudinally striate.

HABITAT.—N.-E. India: The Nambar Forest in Assam (*G. Mann* in Herb. Beccari.)—Native name "Hoka-Bhet" (Mann).

OBSERVATIONS.—This seems very nearly allied to *C. inermis*, but the leaflets though very similar in every respect to the shape of this, are equidistant and not approximate in pairs. It seems also related to some forms of *C. palustris*, from which however it also differs in the regularity of the distribution of its leaflets. The armature of the leaf-sheaths reminds us much of that of *C. latifolius* var. *marmoratus*, but in *C. nambariensis* the secondary spines are ascendant.

To the kindness of Mr. G. Mann I am also indebted for another specimen of a fruit-spadix without leaves of a *Calamus* collected also on the Khasia Hills and forwarded to me with the same number (4) as the male specimens described above.

This spadix, which bears quite mature fruit, is about 1 metre in length, less diffuse than that of *C. khasianus*, spreading, arched, with 7 partial inflorescences and terminating in a tail-like strongly aculeate, 8 cm. long appendix; the first spathe very short acutely two-edged, 6 cm. long, with a few short prickles in its upper part; upper primary spathes 7–8 cm. long, narrowly tubular-infundibuliform, closely sheathing, armed in their upper part with rather strong and short claws; partial inflorescences attached at the mouth of their respective spathes more or less callous at their upper axilla, spreading, arched; the lower ones 35–40 cm. in length with 6–7 spikelets on each side; secondary spathes tubular-infundibuliform, about 2 cm. long, truncate and entire at the mouth with 1–2 small claws in their upper part; spikelets spreading, arched, attached just above the mouth of their own spathe with a distinct axillary callus, very similar to those of *C. khasianus*, but with shorter and more distinctly infundibuliform spathels, the larger ones 10–12 cm. long, with about 10–12 flowers on each side, strongly zig-zag-sinuous; spathels infundibuliform, truncate at the mouth, very narrow at the base, where therefore the axis of the spikelet is very slender at every bend; involucrophorum cupular, truncate, almost entire, two-keeled and obsoletely bidentate on the side next to the axis; involucre cupular, truncate, subcrenulate at the margin; not or very obsoletely bidentate on the side of the neuter flower; areola of the neuter flower lunate. *Fruiting perianth* shortly but very distinctly pedicelliform; the calyx conspicuously constricted at the throat, depressedly subventricose. *Fruit* large, broadly ovate, almost equally rounded at both ends, very suddenly and distinctly mucronate, at the apex with a short caudiculum penetrating into the perianth, 30–32 mm. long (including the caudiculum and the mucro) and 21–23 mm. in diam.; scales cinnamon-brown, shining, in 21 series, deeply channelled along the middle with a dark piont and a very narrow intramarginal line; the margin erosely toothed. *Seed* broadly ovate, somewhat flattened, 18–19 mm. long, 15 mm. broad and 12 mm. thick, strongly pitted all over its surface, the chalazal fovea central, punctiform, not very distinct and with a narrow channel descending from there down to the embryo; albumen superficially ruminate; embryo basal. The fruit described above slightly differs from that of *C. khasianus;* it is larger, more ovoid and with more numerous scales; the seed is also more flattened and larger. I am however unable to decide whether it really belongs to the same species as the male plant upon which I consider *C. nambariensis* to be based.—See observations under *C. quinquenervius* Roxb.

PLATE 193.—Calamus nambariensis *Becc.* Leaf-sheath with the base of a leaf and of a male spadix; an intermediate portion of a leaf (under-surface); the summit of a male spadix.—From Mann's specimen in Herb. Becc.

PLATE 194.—Calamus nambariensis *Becc.* Portion of the lower part of a fruit-spadix and summit of the same spadix; seed from dorsal and raphal side; one seed longitudinally cut in two halves through the embryo; another seed transversely cut.—From Mann's specimen in Herb. Becc.

165. CALAMUS INERMIS T. And. in Journ. Linn. Soc. xi, (1869) 11; Gamble Man. Ind. Timb. 424;

C. latifolius (not of Roxb.) Becc. in Hook. f. Fl. Brit. Ind. vi, 455 (partly).

DESCRIPTION.—High scandent and very robust. *Sheathed stem* 5–6 cm. in diam. naked canes 3 cm. in diam. with internodes 25 cm. long. *Leaf-sheaths* strongly gibbous above, light-coloured when dry, unarmed, almost polished, not or indistinctly longitudinally striate, obliquely truncate and naked at the mouth. *Ocrea* very short axillary, liguliform and narrowly bordering the mouth of the sheath, glabrous. *Leaves* of the upper part of the adult plant cirriferous, very large, 3 metres in length in the pinniferous part; the cirrus itself 2 m. long, very robust, armed at almost regular but gradually shortening intervals with half or three-fourth-whorls of very stout light based and black-tipped claws; petiole very robust, short or very short, up to 2·5 cm. broad, quite unarmed, flat above; rachis in its first or basal portion rounded beneath (as is the petiole), flat above and quite unarmed all round even at the margins; in the intermediate portion very obsoletely angular above and armed beneath along the middle with a few very robust solitary claws; in its upper portion very obtusely bifaced above and armed beneath with 3-nate and when passing into the cirrus 5–6-nate confluent claws; leaflets about 80 in all, usually in twos on each side of the rachis, so that the leaflets of each pair are very close one to the other, and the pairs stand about 10 cm. apart and those of one side usually sub-opposite to or not very distant from those of the other side; in the lower part of the leaf sometimes the leaflets form groups of 3–4 on a side, whilst in the upper part they are less regularly paired and are often solitary or almost regularly alternate, 7–8 cm. apart; those of the summit always solitary and more remote than the others; they are papyraceous, not very firm, rather shining above, opaque and slightly paler beneath, distinctly callous at their insertion, not very strongly 3–5-costulate; the mid-costa distinct, the other nerves slender, all naked on both surfaces; transverse veinlets very slender, margins rather densely and adpressedly spinulous, the lower margin on the upper surface often bordered by a shining stripe, similar stripes not occurring in other parts of the blade; the lower leaflets ensiform, somewhat narrowed towards the base and a good deal more towards the summit, where they are gradually acuminate into a laterally bristly-spinulous tip; the larger ones, those a little above the base, 40–50 cm. long and 3–4 cm. broad, those nearer the petiole narrower, the upper ones on the contrary a good deal larger, lanceolate, those of the summit shorter, 30–35 cm. long and up to 6 cm. broad. *Male spadix* . . . . . *Female spadix* erect, short relatively to the size of the leaves, about one metre in length, terminating in a short tail-like, linear, usually 10 cm. long, aculeolate appendix, rather strict subcupressiform, not very dense, with 4–5 erecto-patent partial inflorescences on each side; primary spathes tubular, closely sheathing, relatively short; lowest primary spathe 12–15 cm. long, strongly flattened, acutely two-edged, totally unarmed, truncate at the mouth, where prolonged at one side into a triangular, dorsally acutely keeled point; the other primary spathes narrowly tubular-infundibuliform, truncate at the mouth where usually exsuccous and sometimes split and decayed, unarmed, prolonged at the summit into a triangular point; partial inflorescences not callous at their insertion, but attached to the axis inside the mouth of their own spathe, from which they arise erect or erectopatent; the lower ones, the largest, about 30 cm. long, with 5–7 spikelets on each side; the upper ones smaller with fewer spikelets; secondary spathes tubular-infundibuliform, about 2 cm. long, almost horizontally truncate, often exsuccous and decayed at the mouth, prolonged at one side into a short point, unarmed or with a few scattered spinules on the dorsal side of their upper part; spikelets inserted without an axillary callus near but inside the mouth of their respective spathe, from which they come forth erect and rigid, but very distinctly and closely zig-zag-sinuous; the lower ones, the largest, 8–10 cm. long, with 8–10 flowers on each side; spathels thinly coriaceous, cyathiform-infundibuliform and subinflated or ventricose, narrowed a good deal to the base, horizontally truncate and entire at the mouth, where more or less apiculate at one side, involucrophorum laterally attached at the base of the spathel above its own and kept at a distance from that by a distinct axillary callus, rather shallowly cupular, truncate, slightly bidentate and not distinctly emarginate on the side next to the axis; involucre moulded on the involucrophorum with a very short truncate limb, obtusely bidentate on the side of the neuter flower; areola of the neuter flower lunate, *Female flowers* ovate. *Fruiting perianth* pedicelliform, 3 mm. long, subglobose the hardened calyx with the tube distinctly constricted at the throat, broadly 3-toothed; segments of the corolla as long as but narrower than the lobes of the calyx. *Fruit* regularly elliptic, shortly and very suddenly mucronate, 27–29 mm. long including the perianth, and 13–15 mm. broad; scales in 18 series, deeply and narrowly channelled along the middle, shining, yellow-straw-coloured with a narrow black intramarginal line, the margins very narrow, finely erosely toothed; the point short. *Seed* ovoid-olivæform, 17 mm. long and 11 mm. broad, sinuously grooved all round, with a narrow furrow along the raphal side and parting from the punctiform chalazal fovea which is situated above the centre.

HABITAT.—This was first found by *Dr. T. Anderson* in the hot and damp valleys of the Sikkim Himalaya at an elevation from 300 to 600 m. From the same locality Lt.-Col. *D. Prain* kindly forwarded to me in 1902 the entire upper portion of a plant with fruit spadices. From this specimen I have derived the description above.

OBSERVATIONS.—The specimen I have described agrees in every respect with an authentic one of Anderson which I had received from the Calcutta Herbarium. In the Flora of British India *C. inermis* had been considered to be the same as *C. latifolius*, from which, however, it is widely different, though the young specimens of the one may be easily mistaken for those of the other, at least when seen in a dry and fragmentary state in herbaria. *C. inermis* has the fruiting perianth pedicelliform whilst it is not so in *C. latifolius*.

The chief characters of *C. inermis* are the very robust stem with perfectly smooth sheaths; the very large leaves with strong and very powerfully clawed cirrus; the smooth petiole and numerous paired large 3–5-costate leaflets, of these the lowest ensiform, the intermediate lanceolate; the costæ smooth on both sides; the female spadix strict; the spikelets erect or erecto-patent, not callous at their insertion; the fruiting perianth ventricose; the fruit large ellipsoid.—See observations under *C. khasianus*.

With the fertile spadices we sometimes meet with some in a rudimentary or abortive state which correspond to the flagella of the non-cirriferous species; they are filiform, erect, flattened, unarmed, sheathed by numerous spathes like those of the fertile spadices, but of course smaller.

PLATE 195.—Calamus inermis *T. Anders.* Portion of the sheathed stem from the upper part of the plant with the base of a spadix; an intermediate portion of a leaf (under surface); portion of the cirrus; the upper part of a female spadix; spikelet with mature fruit.—From Prain's specimen in Herb. Becc.

166. **CALAMUS MANAN** Miq. in Journ. de Bot. Néerl. i, 23 and Prodr. Fl. Sum., 256 and 595 and De Palmis, 28; Teysm. Cat. Hort. Bog. 75; H. Wendl. in Kerch. Les Palm. ii, 236; Becc. in Rec. Bot. Surv. Ind. 211.

DESCRIPTION.—Scandent, very large. *Sheathed stem* 7–8 cm. in diam. *Leaf-sheaths* very thick, woody, strongly gibbous above, fearfully armed at least in their upper part, and likewise at the base of the petiole, with very numerous short triangular, acuminate, light-based, brown-tipped, horizontal or slightly deflexed spines. *Ocrea* in the adult leaves inconspicuous. *Leaves* very large, about five metres long in the pinniferous portion; the cirrus itself 3 metres long and very robust, armed at almost regular intervals with three-fourths whorls of 6–7 confluent very stout black-tipped claws; petiole very short, very robust, about 4 cm. broad at its base, rounded beneath; flattish above; rachis in the first portion biconvex and very densely armed all round, like the petiole, with short very rigid, straight, triangular solitary or confluent spines, not channelled at the sides where are inserted the leaflets; in the intermediate portion almost flat beneath and clawed there at the sides and not along the middle; upwards very obsoletely angular above and clawed beneath at first with solitary and upwards with ternate very robust claws; leaflets numerous, subequidistant, rather remote (6–10 cm. apart) very patent, with a small axillary callus at their insertion, large, lanceolate or broadly ensiform, almost equally tapering towards both ends, acute at the base, long-acuminate at the summit, papyraceous, firm, green, subshining above, opaque and slightly paler beneath, not concavo-convex, plicate, many-nerved with only the mid-costa acute and slightly raised above, and the side nerves unequal, slender, all naked on both surfaces; transverse veinlets minute and numerous not very conspicuous; margins remotely and adpressedly spinulous towards the base, smooth from the middle upwards; the larger ones, those about the middle, 70 cm. long, 5 cm. broad; those near the petiole narrower, the upper ones shorter. *Male spadix* . . . . . *Female spadix* forming an immense large panicle shorter than the leaves, in one specimen 3·5 metres long, its axis very robust, woody, 3 cm. in diam., straight, with numerous, rather approximate (25 cm. apart) partial inflorescences; primary spathes coriaceous, tubular, very closely sheathing, comparatively short; the first very slightly flattened and obsoletely two-edged; the upper ones cylindraceous, very slightly enlarged in their upper part, marcescent at their summit, densely armed with very sharp, broad and short, often confluent black-tipped, deflexed prickles; partial inflorescences inserted at the mouth of their own spathe, not callous at their insertion, and arising erect and then spreading and nodding, the lower ones, the largest, 80–85 cm. long, with 8-9 spikelets on each side, and terminating in a strongly clawed, about 10 cm. long, tail-like appendix; secondary spathes coriaceous, tubular, very slightly infundibuliform, closely sheathing, flat near the base on the inner side, entire and truncate at the mouth, prolonged at one side into a short, broadly triangular, ultimately decayed and marcescent point, densely armed with short robust often confluent and sometimes irregularly whorled claws; spikelets inserted just at the mouth of their own spathe, not very distinctly callous at their axilla, arched, very patent, rigid, their axis cylindraceous, the lower ones, the largest, even 25 cm. long with 15–16 bifarious remote flowers on each side—the upper ones somewhat shorter; spathels shortly tubular, slightly infundibuliform, not or indistinctly striately veined, smooth, horizontally truncate, entire and naked at the mouth, slightly prolonged at one side into a very short acute point; involucrophorum almost exsert from its own spathel and laterally adnate to the base of the one above, shallowly cupular, bidentate and two-keeled on the side next to axis; involucre cupular, entire, or slightly excavate and bidentate on the side of the neuter flower; of which the areola is lunate and sharply bordered. *Female flowers* 5–6 mm. long, patent, 13–14 mm. apart on each side. *Fruiting perianth* distinctly pedicelliform, cylindraceous, 5 mm. thick; the calyx hardened, almost woody and polished (not striately veined), its base acute with 3 very broad triangular lobes; segments of the corolla thinly coriaceous, almost shining, not striate outside, acute, as long as but narrower than the lobes of the calyx; staminal urceolum campanulate, crowned by 6 broad triangular acute lobes. *Fruit* broadly ovoid-elliptic, 30–35 mm. long, 20–22 mm. broad, equally rounded at both ends, topped with a short rather thick mucro and with a small caudiculum at the base enclosed in the perianth; scales in 15–18 series, shining, straw-coloured, with a very dark rather broad marginant line, the largest 6 mm. broad and 4·5–5 mm. long, very slightly prolonged into an obtuse apex, superficially channelled along the middle, the margins obsoletely very finely erosely toothed. *Seed* ovoid, very slightly compressed, rounded at both ends and convex on both faces, covered by a thick adherent once fleshy and acid integument, 18–20 mm. long, 15 mm. broad and 12–13 mm. thick, minutely tubercled and pitted on the back; the chalazal fovea in the centre of the raphal side; albumen deeply ruminated; embryo lateral below the centre.

HABITAT.—Sumatra at Muara Enim and at Muara Dua in the Prov. of Palembang, *Miquel.* Probably also in the Island of Bangka. It furnishes a very long and big Rotang, and the very acid integument of the seed is eaten by the natives (Miquel). It receives the name of "Manan" and "Mangnou" (Miquel).

OBSERVATIONS.—I have seen of this a few detached fruits from the authentic specimens in the Herbaria of the Leyden and Utrecht Museums and a complete spikelet in the Calcutta Herbarium belonging to the same gathering as the above fruits. Moreover, I have received a large fruiting specimen from a plant of uncertain origin cultivated in the Botanic Garden at Buitenzorg, but probably coming from Bangka as in the Leyden Museum one specimen of this same species is labelled: culta Bogor; Bangka.

C. Manan is very closely related to *C. giganteus.* In the general characters of the female spadix, in the structure of the fruit and in the pedicelliform fruiting perianth, as well as in the long-cirriferous leaves it approaches *C. inermis* and allied species; it is however distinct by the not geminate leaflets and the seed with the embryo situated on the face opposite the chalazal fovea a little below the centre.

The fruiting perianth is organically connected by means of strong fibres with the involucra and the axis of the spikelets, and consequently the fruits in Herbarium specimens are very strongly attached to their spikelets and do not easily fall away, and it is only possible to detach them by laceration.

It is one of the largest species of the genus, perhaps only second to *C. andamanicus.*

PLATE 196.—Calamus Manan *Miq.*—Base of a leaf with a small portion of the upper part of its sheath; an intermediate portion of a leaf (upper surface); one of the lower leaflets; the basal portion of a partial inflorescence with mature fruit; seed seen from dorsal and raphal side and one longitudinally cut through the embryo.—From the Buitenzorg specimen mentioned above in Herb. Becc.

167. CALAMUS GIGANTEUS Becc. in Hook. f. Fl. Brit. Ind. vi, 460, and in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—Very robust, scandent. *Leaf-sheaths* almost woody, gibbous above, 5–7 cm. in diam., glabrous, very powerfully armed with numerous unequal spines of which some very large, laminar, 2–3 cm. long, acuminate from a very broad base, solitary or slightly confluent and obliquely subseriate, usually deflexed; these intermingled with many others a good deal smaller and frequently ascendent. *Leaves* cirriferous (*Scortechini*), large, 2·5–3 metr. long (*Scortechini*); petiole 3·5 cm. broad at the base, where flat above—armed with short rather robust spines; rachis very robust, smooth above, and armed beneath only at the sides with comparatively small claws in its first portion; cirrus armed with half-whorled claws; leaflets (in the small portion of rachis seen by me) apparently subequidistant, numerous, 6–8 cm. apart on each side, papyraceous, opaque, glabrous, subglaucous beneath, plicately sub-5-costulate, with other rather prominent secondary nerves between the stronger costæ (all nerves naked on both surfaces) broadly ensiform, 55–60 cm. long, 3–4 cm. broad, very gradually attenuate to both ends, acute at the base, acuminate at the summit into a subulate tip; transverse veinlets not very conspicuous, approximate, margins smooth. *Male spadix* ultra-decompound with many large panicled partial inflorescences; one of these about 45 cm. long with 5 stout gradually decreasing branchlets or compound spikelets on each side; primary spathes . . . . . ; secondary spathes tubular-infundibuliform, about 3 cm. long, closely sheathing, somewhat narrowed to the base where flat on the inner side, with acute margins, convex on the back, sparingly aculeolate, truncate and entire at the mouth and prolonged at one side into a triangular acute or acuminate erect point; branchlets inserted a little above the mouth of their own spathe with a rather distinct axillary callus; the lower ones, the largest, 20–22 cm. long, with 5–7 very closely alternately and flatly bifarious spikelets on each side; tertiary spathes (those of the branchlets) shortly and broadly infundibuliform, truncate, entire at the mouth and apiculate at one side; spikelets inserted at an angle of 45° just at the mouth of their own spathe, flattened, short, 15–20 mm. long, with 5–10 perfectly flatly bifarious and closely packed flowers on each side; spathels concave, broadly bracteiform, extended at one side into a broad, slightly apiculate point, which is longer than the involucre and subtends its flower; involucre half-enclosed in its own spathe and attached at the base of the one above, dimidiately cupular or like a swallow's nest, deep, lunately excavate, bidentate, and acutely two-keeled on the side next to the axis. *Male flowers* not seen as they had fallen when the specimens were gathered. *Female spadix* simply decompound, a good deal larger than the male one, with a very stout axis and many partial inflorescences and terminating in a caudate somewhat aculeate appendix; primary spathes tubular, coriaceous, very closely sheathing; the two first very short and broad (10–15 cm. long, 3–3·5 cm. broad) distinctly flattened, and acutely two-edged, densely and sparsely aculeate; the upper ones more elongate and more cylindraceous, slightly narrowing towards the base, where flat on the inner side, densely armed with small stout blackish hooked scattered prickles, obliquely truncate at the mouth and prolonged at one side into a triangular erect dorsally keeled point; partial inflorescences about 30 cm. apart one from the other, elongate, inserted at the mouth of their own spathe; their axes very stout, in one specimen 70 cm. long, with 10 distichous spikelets on each side, and terminating in a short aculeate tail-like appendix; secondary spathes as in the male spadix, but slightly larger; spikelets inserted at the mouth of their own spathe with a rather distinct axillary callus, very robust and rigid, somewhat flattened, arched and deflexed, 10–16. cm. long with 14–18 distichous flowers on each side, the upper ones the shortest; spathels asymmetrically broadly infundibuliform, short, truncate, entire, dirty-furfuraceous, smooth; involucrophorum sessile, cupular, attached almost outside its own spathel at the base of the one above; involucrue cupular, shallow, entire, slightly excavate and bidentate on the side of the neuter flower of which the areola is very distinct, lunate and sharply bordered. *Fruiting perianth* distinctly pedicelliform, 6 mm. long; tubular cylindraceous, slightly inflated at the base, polished (estriate), divided midway down into 3 broad acute lobes; segments of the corolla opaque, barely longer and a good deal narrower than the lobes of thecalyx. *Fruit* rather large, the only one, not quite mature, seen by me, 28 mm. long, ovoid-elliptic, very suddenly and shortly beaked and crowned by the small slender recurved stigmas and with a small basal caudiculum enclosed in the perianth; scales in 15 series, broadly and rather deeply channelled along the middle, shining, yellowish-brown with a very broad almost black marginal line, tip short obtuse, margins erosely toothed. *Seed* . . . . .

HABITAT.—The Malayan Peninsula. Discovered by Father Scortechini in the State of Perak (*Scortechini* in Herb. Becc.) and found again in the State of Johore at Kwala Tebing Tinggi by H. N. Ridley in 1901. (Ridley Nos. 11202 and 11203 in Herb. Berol.)

OBSERVATIONS.—This is one of the largest species of *Calamus* known, very closely related to *C. Manan*, from which it differs in the leaflets paler beneath than above, with smooth margin, and in the spikelets shorter, stouter and distinctly flattened. Scortechini's specimen consists of a portion of a male spadix out of flower, a small portion of a very large leaf, and an entire partial inflorescence with only one immature fruit. Ridley's specimens are more complete as to the leaves, but the female spadix bears only ovaries in course of development. The leaves evidently terminate in a flagellum; the leaflets are as much as 14–16 cm. apart on each side, where there is often a tendency to be approximate in pairs, subglaucescent beneath; the rachis subbiconvex in section in its first portion where rather densely armed beneath at the sides with stout claws, bifaced above towards the summit where armed beneath with half-whorled claws. The female spadix terminates in an abortive flagellum which is 40 cm. long and is armed all round with solitary broad-based black-tipped claws, the partial inflorescences are 25–35 cm. long with 5–6 spikelets on each side, these somewhat more slender than in Scortechini's specimen.

PLATE 197.—Calamus giganteus, *Becc.* Leaf-sheath with base of the petiole; portion of leaf from near the base (upper surface); portion of the female spadix from near its base, with an entire partial inflorescence and one immature fruit; branchlet from a male spadix when all the flowers had fallen away.—From Scortechini's specimen in Herb. Becc.

168. CALAMUS PLATYACANTHUS Warb. (name only in Herb. Berol.) not of Mart.

DESCRIPTION.—Robust, not very high scandent. *Leaf-sheaths* apparently 4–5 cm. in diam., almost woody, gibbous above, fearfully armed with very large, flat, laminar, elongate, triangular-lanceolate, very acuminate, very approximate, solitary or more often confluent-subseriate or subverticillate spines, which are light-coloured or greenish-brown like the sheaths and sometimes attain the enormous length of 8-9 cm. being 10–15 mm. broad at their base; the spaces between these large spines are covered as in *C. nambariensis* with smaller ascendent ones. *Ocrea* very short, reduced to a small axillary glabrous and naked ligula and a narrow rim at the mouth of the sheath. *Leaves* very large, apparently very much like those of *C. khasianus*, but seen by me only in a very fragmentary state; petiole flat above, where its surface is covered with small erect prickles, rounded beneath; rachis the intermediate portion of the leaf) obsoletely bifaced above, convex beneath, where armed on each side with solitary and along the middle geminate (probably ternate higher up) rather robust claws; leaflets large, concavo-convex, oblong or oblanceolate, 43 cm. long, 8–9 cm. broad, papyraceous, firm, opaque, green, slightly paler beneath, attenuate towards the base, somewhat callous at their insertion, rather suddenly narrowed to the summit into a short laterally bristly spinulous tip, with 5 costæ and 2–3 secondary slender nerves between each of them; the costæ slender but rather acute and all about of the same strength, naked or occasionally sparingly spinulous in the upper surface, indistinct and naked beneath, transverse veinlets numerous very slender; margins acute, very closely and adpressedly spinulous, the lower one bordered in the upper surface with a shining band. *Male spadix* . . . . . *Female spadix* 60 cm. long (*Balansa*) with a few diffuse partial inflorescences, apparently a good deal like that of *C. khasianus*; upper primary spathes tubular, closely sheathing, narrowed towards the base, here flat on the inner and convex on the outer side, where armed with straight and somewhat deflexed prickles; the largest partial inflorescence seen by me 35 cm. long, spreading, somewhat callous at its insertion with 11 (in all) distichous spikelets and terminating in a very short prickly caudiculum; upper inflorescences a good deal shorter than the lower ones; secondary spathes narrowly tubular-infundibuliform, 2·5 cm. long, truncate at the mouth, prolonged at one side into a triangular decayed point, rather densely prickly all round but especially on the back of their upper part; spikelets spreading or deflexed, inserted at the mouth of their respective spathes with a rather distinct axillary callus; the lower ones, the largest, 8 cm. long with 9–10 flowers on each side; the upper ones much shorter, strongly zig-zag-sinuous between each flower; spathels asymmetrically infundibuliform, narrowed a good deal towards the base, horizontally truncate and entire at the mouth where densely ciliolate-paleaceous, distinctly apiculate at one side, not striately veined, usually furnished with a hooked spine on the middle of their back, more or less scaly-furfuraceous; involucrophorum laterally attached to the base of the spathel above its own with a rather distinct axillary callus next to the axis, cupular, rather shallow, flat, two-keeled, bidentate and slightly excavate on the side next to the axis; involucre moulded on the involucrophorum, cupular, rather shallow, more or less distinctly bidentate, remotely excavate between the teeth on the side of the neuter flower, otherwise entire and ciliolate-furfuraceous at the margin; areola of the neuter flower lunate, very sharply bordered. *Fruiting perianth* distinctly pedicelliform; the calyx cylindraceous with 3 short and broad teeth; the segments of the corolla a good deal narrower than the lobes of the calyx and almost shorter than these. *Fruit* when quite ripe ovoid-elliptic, very suddenly mucronate, 22 mm. long including the mucro and the pedicelliform perianth, and 13–14 mm. broad; scales in 18 series, shining, deeply channelled along the middle yellowish-brown with a slightly elongate darker point, the deeper colour extending at the sides as a narrow intramarginal line, the margins narrowly but distinctly scarious and finely erosely toothed. *Seed* ovoid-oblong, 10–12 mm. long, 7 mm. broad, not or very slightly flattened, strongly pitted and boldly tubercled on the back, with a narrow elongate chalazal fovea on the centre of the raphal side; albumen slightly ruminate; embryo basal.

HABITAT.—Tonkin; in the forest of Mount Bavi, at about 700 metr. elevation, *Balansa*, No. 4360: Nov. 1887, in Herb. Berol. and Kew.

OBSERVATIONS.—The fruit is a good deal like that of *C. Doriaei*, but it is less elongate or more typically ovoid. It approaches also *C. khasianus*, but this has much larger fruit. According to a note of the collector, the fruit has a whitish very acid pulp.

C. platyacanthus Mart. is a *Dœmonorops*, and therefore it has been possible to keep the suggestive specific name given by Warburg to this very distinct species.

PLATE 198.—Calamus platyacanthus *Warb.*—Portion of leaf-sheath with base of a leaf; an entire partial inflorescence of a fruit-spadix; seed from dorsal and raphal side, and longitudinally cut through the embryo.—From Balansa's type specimen in Herb. Berol.

169. CALAMUS ALBUS Pers. Enchir. i, 383 (excl. syn. Lour.); Mart. Hist. Nat. Palm. iii, 342; Walp. Ann. iii, 491 and v, 832; Blume, Rumphia, iii, 31 in note; Miq. Fl. Ind. Bat. iii, 137 and De Palmis, 29; Becc. Malesia, i, 88; H. Wendl. in Kerch. Les Palm. 235.

C. rudentum (not of Lour.) Roxb. Fl. Ind. iii, 776; Becc. in Rec. Bot. Surv. Ind. ii, 213.

Palmijuncus albus Rumph. Herb. Amb. v, 102, t. liii; Hassk. Neuer Schlüssel zu Rumph's Herb. Amb. 100 (excl. many syn.).

DESCRIPTION.—High scandent and rather robust. *Sheathed stem* 2–5 cm. in diam. *Leaf-sheaths* thick, almost woody, strongly gibbous above, light yellowish-green (like the other parts of the plant) when dry, armed (often very densely) with uniform, scattered, small, very narrow, straight acicular rather short (1 cm. long at most), black-tipped, horizontal spines, which rest on a small bulbous light base. *Ocrea* very short, liguliform. *Leaves* large, 2–3m. in the pinniferous part; the cirrus very long and robust, armed at almost regular intervals with half-whorls of very stout black tipped claws; petiole very robust and rather short, up to 2–3 cm. broad, roundish, smooth or more or less prickly beneath, flat above and, like the first portion of the rachis, more or less, sometimes densely, armed with narrow, short, straight, erect spines; margins also usually armed with short prickles; rachis armed beneath along the middle with at first solitary and upwards geminate and ternate claws, more or less distinctly bifaced above in its upper part; leaflets numerous, large, equidistant, rather remote (6–10 cm. apart); the lower ones usually opposite, the upper ones alternate, papyraceous, rather firm, green and subconcolorous on both surfaces, the largest slightly concavo-convex, narrowly or broadly lanceolate, almost equally tapering towards both ends, acute at the base, acuminate at summit into a bristly-spinulous tip, 5-costulate; the costae rather slender, the 3 central remotely bristly-spinulous above, the side ones usually, but not always, smooth, all about of the same strength, underneath all naked and very slightly prominent; transverse veinlets not very conspicuous; margins rather closely spinulous; the largest leaflets, those a little above the base, 45–65 cm. long, 5–7 cm. broad, the lower ones somewhat narrower, the upper ones gradually smaller. *Male spadix* supradecompound, forming a large and rather dense pyramidate panicle up to 2 m. in length, always shorter than the leaves, with a short and very robust slightly flattened peduncular part (this 10 cm. long, 3 cm. thick), with many approximate and gradually diminishing partial inflorescences; the uppermost of these very small and bearing at its base a short inconspicuous tail-like few cm. long appendix, which is the rudiment of the flagellum; primary spathes similar in the male and female spadix, thinly coriaceous very short, tubular, the lowest 15 cm. long at most, the upper ones 5–8 cm. narrowly infundibuliform or somewhat narrowed towards the base where flat on the inner side, very closely sheathing, thinly coriaceous or pergamentaceous, truncate, entire and naked at the mouth, prolonged at one side into a triangular elongate dorsally keeled point, smooth in their lower part and armed upwards, often rather densely, with short prickles; lowest partial inflorescences 50–60 cm. long (the upper ones gradually shorter) with many branchlets on each side, of these the larger ones, the lowest, 20 cm. long, with 12–13 spikelets on each side; secondary spathes unarmed or nearly so, narrowly infundibuliform, closely sheathing, 2–2·5 cm. long, obliquely truncate and entire at the mouth, prolonged at one side into a triangular acute point; male spikelets small, 3–4 cm. long; the upper ones shorter, with 12–15 very approximate flowers on each side, arched, spreading attached at the mouth of their own spathe; spathels bracteiform, ovate, concave, strongly striately veined, deflexed, with an acute ascendent point; involucre cupular, truncate, with an acute tooth on each side. *Female spadix* very robust, in one specimen 1·5 m. in length, simply decompound, with many rather approximate distichous partial inflorescences and terminating with an aculeolate tail-like, 15 cm. long, appendix; primary spathes as described above; partial inflorescences inserted at the mouth of their own spathe with a rather distinct axillary callus, rigid, spreading and somewhat arched; the larger ones, the lowest, up to 1 m. in length and with 12 spikelets on each side; the upper ones much shorter; secondary spathes tubular, slightly infundibuliform, 2-3 cm. long, entire, truncate at the mouth, prolonged at one side into a triangular acute erect point, finely striately veined, flat at the base on the inner side, unarmed or with 1–2 small spinules on the back near the summit; spikelets horizontally inserted at the mouth of their own spathe, with a distinct axillary callus, arched, rigid, slightly zig-zag-sinuous, the larger ones (the lowest) up to 25 cm. long, with about 18–20 flowers on each side; the uppermost 6–7 cm. only, with fewer flowers; spathels infundibuliform, narrowed a good deal towards the base, horizontally truncate and entire at the mouth, slightly prolonged at one side into a very short, broadly triangular point, glabrous, finely striately veined; involucrophorum almost exsert from its own spathel and laterally attached to the base of the one above, short, cupular, two-keeled and obsoletely bidentate on the side next to the axis; involucre cupular, very slightly exceeding the involucrophorum, truncate, obsoletely bidentate on the side of the neuter flower, of which the areola is rather large, distinctly lunate and rather sharply bordered. *Female flowers* remote (about 1 cm. apart), patent, about 4 mm. long. *Fruiting perianth* pedicelliform. The calyx campanulate, almost polished outside and not or indistinctly striately veined, split midway down into 3 broadly triangular lobes; the segments of the corolla also polished outside, acute, about as long as but narrower than the lobes of the calyx. *Fruit* globoso-obovoid or obovoid-subturbinate, rounded at the summit where topped by a distinct mucro, caudiculate at the base, 18–19 mm. long (including the mucro and the perianth), 12–14 mm. broad; scales in 15 series, shining, rather convex, faintly channelled along the middle, straw-coloured with the point obtuse sometimes slightly prolonged and spotted with reddish-brown; the margins scarious, erosely toothed, usually lighter or with vestiges of a very narrow darker intramarginal line. *Seed* when covered with the dry integument, which even when dry retains a very acid taste, ovoid, about 10 mm. long, boldly tubercled and deeply pitted on the back when freed from the integument, flattish, with a superficial chalazal fovea on the raphal side; albumen coarsely ruminate; embryo basal.

HABITAT.—Rumph says that this species grew in sandy places on the northern part of the Gulf of Amboina, and that it received the names of "Rottang (or Ua) putti" (=white) and more specially that of "Ua Ela" or "Ua Ahun Tayn," that is to say, the "pigeon or bird dung Rotang" on account of the white patches on its leaf-sheaths.

Rumph gives also many details about the uses of this Rotang, which is of a good quality and much employed, like the other species, either whole or reduced to strips.

OBSERVATIONS.—I have written the description of *C. albus* on very complete cultivated specimens, which I have received from the Botanic Garden of Buitenzorg, but I have not a shade of doubt about these being conspecific with the plant described and figured in the Herbarium Amboinense, as one authentic specimen of *C. albus* from Rumph himself has been found by me amongst the ancient collections of the Museum of Natural History in Florence. It is now well known that in the year 1682 Rumph sent a very large collection of the Natural History objects of which he made use for the description and the plates of his famous works to the Grand Duke of Tuscany (see M. Martelli: Le Collezioni di G. E. Rumph: Florence 1903). Of these collections one catalogue was written by G. Targioni-Tozzetti, and in this are enumerated two species of *Palmijuncus* and precisely the *P. albus* and the (*P. Calapparius Dœmonorops Calapparius*) (Martelli l. c. p. 163) which probably are now the only extant botanical specimens of all the plants described or figured in the "Herbarium Amboinense." Rumph's authentic specimen of *Palmijuncus albus* (*C. albus*) consists of a portion of a partial inflorescence, 16 cm. in length, with 3 spikelets on each side, which bear still attached 11 fruits. This specimen in the minutest details exactly agrees with the corresponding parts of the cultivated plants, only the fruit in Rumph's specimen is slightly larger, being riper.

Rumph describes the leaf-sheaths of *Palmijuncus albus* as mottled, but this character, as I have observed in other species, is often only apparent in the very young sheaths of the upper part of the plant, while the specimens I have examined were all adults. Further in Rumph's plate the sheaths appear armed with whorled spines, whereas they are scattered in the Buitenzorg specimens. These vary a good deal in size, some of them having the sheathed stem 2 cm. in diam., while it is 5 cm. in others.

In the Botanic Garden of Buitenzorg this seems a species which has spread out amongst the others, as I have received it with 5 different numbers and different localities and none from the Moluccas; one is said to come from Timor. In a confined space it is very difficult to keep the species of *Calamus* distinct when they are cultivated close together, as their seeds fall to the soil and germinate promiscuously, and the more invading species take the place reserved for the others.

PLATE 199.—Calamus albus, *Pers.*—The base of a leaf with portion of its leaf-sheath; two leaflets with portion of their rachis, this seen from the upper surface; portion of the cirriferous summit of a leaf; portion of a fruit spadix; spikelet with almost mature fruit; seeds.—From a plant cultivated at Buitenzorg, Herb. Becc.

170. CALAMUS PALLIDULUS Becc. in Hook. f. Fl. Brit. Ind. vi, 457 and in Rec. Bot. Surv. Ind. ii, 211.

DESCRIPTION.—Rather slender or of moderate size. *Sheathed stem* 13–20 mm. in diam. *Leaf-sheaths* (not flagelliferous?) very thick, coriaceous, greenish or light straw-coloured (as almost every other part of the plant though dry) armed like the base of the petiole on its back with short strong spines which rest on a broad and swollen base. *Leaves* with a short (30–40 cm. long) pinniferous part and lengthened out into a rather long and robust cirrus; petiole very short or almost obsolete; rachis and cirrus strongly armed beneath with uniform, black-tipped, 3-fid claws; leaflets very few, 4–5 on each side, inequidistant but not aggregate, light yellowish-green when dry, rigid, pergamentaceous, paler beneath than above, elongate-ensiform, tapering towards the base, gradually or even rather suddenly narrowed at the summit into an elongate naked (not hairy or bristly) tip; the lower ones distinctly callous at their insertion, 20–25 cm. long, 15–20 mm. or occasionally 30–35 mm. broad and then lanceolate, with the mid-costa acute and the side nerves slender; all nerves naked on both surfaces; transverse veinlets rather distinct, especially above; margin remotely spinulous. *Male spadix* . . . . . *Female spadix* diffuse, not flagelliform, relatively large (not seen entire); primary spathes tubular-cylindraceous, 7–8 cm. long, slightly enlarged above, and slightly narrowed towards the base where flattish on the inner side, thinly coriaceous, closely sheathing, truncate, entire and densely ciliate-paleaceous at the mouth, where shortly prolonged at one side into a triangular acute point, armed with rather numerous, scattered, very small, light-based black-tipped claws; the first not differing from the following; partial inflorescences rather approximate (about 10 cm. apart), spreading, inserted above the mouth of their own spathe with a distinct axillary callus; those seen by me 20–35 cm. long with 5–8 distichous spikelets on each side and terminating in a very short slender tail-like unarmed appendix; secondary spathes tubular and slightly infundibuliform, 2–2·5 cm. long, truncate and densely ciliate-paleaceous at the mouth where shortly extended at one side into a triangular, patent, acute point, sparsely aculeolate, especially near the summit and on the outer side and further more or less covered with small adpressed ferrugineous tufts of hair which rest upon small asperities of the surface; spikelets inserted just at the mouth of their respective spathe with a distinct axillary callus, slightly arched, spreading, their axis slightly sinuous, vermicular, cylindraceous, rather slender but rigid, the largest ones, the lowest, about 10 cm. long, with about 10 flowers on each side, the uppermost somewhat shorter; spathels scabrid like the secondary spathes, but more densely, shortly tubular, slightly infundibuliform, entire, truncate and ciliate at the mouth, where shortly prolonged at one side into a triangular point; involucrophorum shallowly cupular, almost exsert from its own spathel and laterally attached to the base of the one above, posticously bidentate, involucre slightly exceeding the involucrophorum, shallowly cupular, almost entire; areola of the neuter flower depressedly lunate. *Female flowers* small, about 4 mm. long, rather remote, bifarious. *Fruiting perianth* pedicelliform, slightly ventricose and smooth at the base; teeth of the calyx broadly triangular; segments of the corolla as long but narrower. *Fruit* (mature) sphæric, 18 mm. in diam., tipped by a small mucro; scales in 15–18 series, rhomboid, broader than long, rather opaque, yellowish-brown shining, often very narrowly bordered with reddish-brown, and scarious at the margin, narrowly and superficially channelled along the middle, the point very slightly suddenly prolonged, obtuse. *Seed* globular-ovoid, 12 mm. long, very deeply and closely pitted all round; chalazal fovea indistinct; albumen deeply ruminate; embryo subbasal.

HABITAT.—The Malayan Peninsula at Taiping (No. 2392) and at Simpang (No. 3017) in the district of Perak (*L. Wray*, Herb. Mus. Perak); Singapore, (*Ridley* No. 6281).

OBSERVATIONS.—The description is taken from a portion of a spadix with immature fruit (No. 2392) and a few mature fruits (No. 3017) and two leaves with a small portion of their sheath. Ridley's specimen from Singapore consists only of a portion of the spadix with very young fruits which have more numerous scales, being disposed in 18 instead of 15 longitudinal series.

Distinguished by its general light-yellowish colour when dry, in this respect recalling *C. spathulatus*. In the group it is moreover distinguishable by its leaves with a short pinniferous part, the elongate inequidistant smooth not fascicled leaflets; the scabrid secondary spathes and spathels.

PLATE 200.—Calamus pallidulus, *Becc.* An entire leaf with a small portion of the sheath and lower portion of a female spadix with mature fruit; detached fruits and seeds;—from Wray's specimen No. 3017, Herb. Perak. in Herb. Calc. Summit of a partial inflorescence with immature fruit,—from No. 2392 Herb. Perak. in Herb. Calc. ?

171. CALAMUS MACROSPHAERION Becc. sp. n.

DESCRIPTION.—Apparently scandent and of large size. *Leaf-sheaths* . . . . . *Leaves* . . . . . . *Male spadix* . . . . . . *Female spadix* apparently rather large; the main axis in the small portion seen by me bears only one partial inflorescence 1 cm. thick; upper primary spathes tubular, closely sheathing, thinly coriaceous, light greenish though dry, armed externally in their upper part with very small deflexed subturberculiform prickles; the partial inflorescence seen by me at first ascendent and then spreading, about 25 cm. long, with 5 spikelets on each side; secondary spathes unarmed, tubular, slightly enlarged in their upper part, closely sheathing; flat with acute margins on the inner side; spikelets inserted above the mouth of their spathe with a distinct axillary callus, spreading, slightly arched, thick and comparatively short. 4-4·5 cm. long with 8–9 approximate bifarious flowers on each side; spathels coriaceous, very short, concavo-subcymbiform, prolonged externally into a broad rather obtuse point; involucrophorum shortly cupular, subtended by its own spathel, two-keeled on the side next to the axis; involucre cupular, slightly exceeding the involucrophorum, coriaceous, truncate, obsoletely bidentate on the side of the neuter flower, the areola of which is very conspicuous, lunate and sharply bordered. *Fruiting perianth* distinctly pedicelliform; the calyx with 3 very short broadly triangular teeth; the segments of the corolla narrower and slightly longer. *Fruit* sphæric, about 2 cm. in diam., very shortly mammillate; scales in 15 longitudinal series, very thick, shining, convex, narrowly channelled along the middle, straw-yellowish or yellowish-brown with acute very narrow scarious finely erosely toothed margins and an obtuse tip. *Seed* globular, 12 mm. in diam., minutely tubercled; albumen very deeply ruminate; chalazal fovea punctiform, very small, penetrating far inside; embryo opposite the chalazal fovea.

HABITAT.—North Celebes in the Prov. of Minahassa at Tomohon, the brothers *Sarasin* in Herb. Berol.

OBSERVATIONS.—I have seen of this only a very small portion of the spadix with only one partial inflorescence, bearing quite mature fruit. This specimen was united in the Berlin Herbarium with a specimen of *Daemonorops Sarasinorum* Warb., and on this ground I consider it as collected at the same time and locality with this.

It is very distinct amongst the species known to me by its large round fruit with a very deeply ruminated seed, but there is no doubt about its affinities with *C. albus* and *C. pallidulus*, and these are shown also by the greenish-yellow tint of the different parts of the spadix, only partially hidden by a furfuraceous removable dark scurf.

PLATE 201.—Calamus macrosphærion *Becc.* Portion of the spadix with an entire partial inflorescence bearing mature fruit; seed entire and in longitudinal section through the embryo.—From the type specimen in Herb. Berol.

172. CALAMUS MATTANENSIS Becc. in Rec. Bot. Surv. Ind. ii, 216.

DESCRIPTION.—Scandent, rather slender or of moderate size. *Sheathed stem* 12–17 mm. in diam. non-flagelliferous (always?). *Leaf-sheaths* gibbous above, very obliquely truncate and naked at the mouth, very thick and almost woody, strongly armed with light coloured (as the surface of the sheath) unequal spines; of these the largest are flat, narrowly lanceolate, 10–15 mm. long, and with a broad base which is swollen above, concave underneath, and decurrent at the sides. *Ocrea* inconspicuous. *Leaves* rather large, cirriferous, about 1 m. long in the pinniferous part; petiole rather robust, 6–8 mm. broad, 25 cm. long, flattish or slightly convex above, rounded beneath, where armed along the middle, as at the sides, with solitary distant claws;

rachis in its upper portion acutely bifaced above and armed beneath at first with solitary and upwards, as in the terminal not very robust cirrus, with rather strong ternate claws; leaflets not very numerous, 8–9 on each side, very inequidistant, never very close together, but more or less distinctly and irregularly approximate into a few groups, firmly papyraceous, concolorous, yellowish-green (when dry), shining or subshining above, quite without bristles or spinules on both surfaces, linear or elongate-ensiform, somewhat narrowed to and acute at the base, gradually attenuated towards the summit into an acuminate or sometimes rather suddenly obtuse, sparingly and shortly bristly tip, longitudinally plicate, with the mid-costa acute and raised above, and the side nerves very slender; beneath all nerves slender; transverse veinlets slender inconspicuous; margins finely very adpressedly spinulous, the largest leaflets, the lower ones, 32–35 cm. long, 2–3 cm. broad; those near the summit somewhat shorter and narrower.—Other parts unknown.

Habitat.—Borneo, on Mount Mattang near Sarawak, *Beccari* P. B. Nos. 1905 and 1930.

Observations.—This appears closely allied to *C. pallidulus* and, as in that species, all parts of the plant, but especially, the leaflets, assume in herbarium specimens a peculiar yellowish green tint.

It differs from *C. pallidulus* in its leaves with a long petiole, a more elongate pinniferous part and more numerous leaflets.

I have collected of this two specimens, each with an entire leaf and a portion of the sheathed stem; in both specimens the sheath has no trace of a flagellum.

Plate 202.—Calamus mattanensis *Becc.* Portion of the sheathed stem with an entire leaf (Becc. P. B. No. 1930).

173. **Calamus Oxleyanus** Teysm. & Binnend. in Cat. Plant. Hort. Bot. Bogor. (1866), 75 (name only); Miq. De Palmis Archip. Ind. Obs. Nov. 17, with plate; H. Wendl. in Kerch. Les Palm. 237; Becc. in Hook. f. Fl. Brit. Ind. vi, 458, and in Rec. Bot. Surv. Ind. ii, 214.

Daemonorops. fasciculatus Mart. Hist. Nat. Palm. iii, 330 (1850?); Walp. Ann. iii, 480 and v, 829; Miq. Fl. Ind. Bat. iii, 101.

Calamus Fernandezii H. Wendl. in Kerch. Les Palm. 236 (1878). *Rotang Pajare* Griff. in Calc. Journ. v (1845), 89, and Palm. Brit. India, 98 (1850).

C. diffusus Becc. in Hook. f. Fl. Brit. Ind. vi, 447 (as to the male spadix) and in Rec. Bot. Surv. Ind. ii, 206.

Description.—Erect (later scandent?). *Sheathed stem* about 5 cm. in diam. *Leaf-sheaths* not flagelliferous, not gibbous above, gradually passing into the petiole and open a good way down on the ventral side, very densely and irregularly armed with large, flat, very acuminate, straight, unequal (up to 2–3 cm. long), blackish, shining spines. *Ocrea* narrowly bordering the mouth of the sheath, brittle and decidnous. *Leaves* large, 3–3·5 metres long, not including the cirrus; petiole (30–60 cm. long), 10–15 mm. broad, yellowish (when dry), polished, sparingly prickly near the base or quite smooth and flattish in the upper surface, rounded beneath, where smooth in the first portion or more or less armed throughout along the middle with short solitary claws; margins armed with straight, horizontal, unequal, brown-tipped spines, of which some very short, and others, chiefly those near the base, up to 2 cm. long; rachis just beyond the petiole subbiconvex, in the intermediate portion with a very obtuse and smooth angle above and with solitary claws beneath along the middle and still more at the sides; towards the summit acutely bifaced above, and beneath with the claws more or less aggregate or half-whorled along the middle and solitary, scattered and numerous at the sides; the cirrus rather robust and long, furnished with half-whorls of robust quinate black-tipped claws; leaflets numerous, very distinctly grouped, inserted at a wider angle or sub-horizontal, all in one plane (not pointing different ways); the groups of each side composed of 4–10 leaflets, and these in each group almost equidistant (15–22 mm. apart), the groups of one side opposite or alternate with those of the other side and with long vacant spaces (15–25 cm. long) interposed; all leaflets of about the same size and shape, 20-30 cm. long, 18–20 mm. broad, those near the cirrus barely smaller than the others, thinly papyraceous, glabrous, subshining and green on both surfaces, linear-lanceolate, somewhat narrowed towards the base, gradually acuminate to the summit into a subulate bristly tip, 3- to sub-5-costulate, usually with the 3 central costae which are sprinkled on the upper surface with a few black bristles (these with a bulbous white base); the other 2 nerves usually slender and smooth or occasionally bristly; all nerves very slender and naked beneath; transverse veinlets sharp and distinct, much interrupted and not very approximate; margins acute, very adpressedly spinulous. *Male spadix* ultra-decompound, rather large, about 1 m. long; primary spathes papyraceous, smooth or sparingly prickly, tubular, not very closely sheathing in their upper part where somewhat enlarged, opened on the ventral side and prolonged into a narrowly auriculiform, elongate, dorsally keeled, somewhat flattened, acuminate point; secondary spathes tubular, slightly enlarged above, closely sheathing, striately veined, prolonged at the summit into a triangular point, prickly chiefly on the outer side at the base, or smooth; partial inflorescences and branchlets inserted at or a little above the mouth of their own spathe, with a more or less distinct axillary callus; tertiary spathes usually unarmed; spikelets spreading, inserted at the mouth of their own spathe, slightly callous at their insertion, 2–3·5 cm. long (that terminating the branchlets somewhat longer) with 10–16 horizontal flatly bifarious flowers on each side; spathels bracteiform, very broad, concave, strongly deflexed, the point short, broad, obtuse or apiculate, subtending the flower; involucre exactly cupular, sometimes longer than broad, deep, entire, shorter than its own spathe and laterally attached to the base of the one above. *Male flowers* oblong and rounded at the top when in bud, 4 mm. long; calyx shortly campanulate, faintly striately veined, with 3 very broad, short, triangular, acute teeth; corolla twice as long as the calyx or even longer; segments oblong, smooth outside. *Female spadix* simply decompound with many partial inflorescences; primary spathes as in the male spadix, but perhaps more thick in texture and more densely prickly; partial inflorescences diffuse, spreading, arched, inserted at or near the mouth of their own spathes;

the largest, the lower ones, about 50 cm. long, with 8-9 spikelets on each side and terminating with a very small slender unarmed caudiculum; the upper ones a good deal shorter; secondary spathes papyraceous or submembranous, tubular, 2-2·5 cm. long, slightly enlarged above, closely sheathing, unarmed, finely striately veined, very obliquely truncate and naked at the mouth, prolonged at the summit into a triangular acute point; spikelets vermicular, their axis cylindraceous, rigid, slightly flexuous, spreading, inserted just at the mouth of their own spathes with a distinct axillary callus, the lower ones of each inflorescence the largest, up to 18–20 cm. long with 20–22 flowers on each side, the upper ones gradually smaller; spathels finely striately veined, shortly tubular, slightly enlarged above and prolonged at one side into a broadly triangular deflexed acute point; involucrophorum very shallow, orbicular, exsert from its own spathel and laterally attached to the base of the one above; involucre exactly cupular, rather shallow, shining inside, the margin entire; areola of the neuter flower lunate, usually shining and callous in the centre. *Female flowers* about 4 mm. long, remote (1 cm. apart on each side), bifarious, horizontal; the calyx coriaceous with a flat and polished base not or indistinctly striately veined, deeply parted into 3 very broad acute lobes; the corolla slightly longer than the calyx, its segments ovate-acute. *Fruiting perianth* shortly pedicelliform. *Fruit* globular, small, about 1 cm. in diam. topped by a slender 2 mm. long, conspicuous mucro; scales few, in 12 longitudinal series, each of these with 5–6 scales, strongly convex, superficially channelled along the middle, shining, straw-coloured with a red-brown marginal line; tip very obtuse; margins erosely toothed. *Seed* irregularly globular, wrinkled; albumen equable; embryo basal? (I have not seen perfectly mature seeds.)

HABITAT.—The Malayan Peninsula at Malacca (*Griffith*); Singapore, at Bukit Timah, (*Ridley* No. 6283 in Herb. Becc. and No. 10780, male plant, in Herb. Kew); State of Johore at Gunong Pulai (*Ridley* No. 3719, in Herb. Kew); Island of Bangka (*Teysmann*, *Miquel*).

OBSERVATIONS.—I have identified with *C. Oxleyanus* Teysm. & Binnend., the *Rotang Pajare*, which was recognised by Griffith as a new and distinct form without assigning to it a scientific name. Griffith's specimens were only portions of the leaves of which I have seen a part in the Herbarium at Kew. I have to make many remarks regarding the identification of this species, and I will proceed chronologically:—

I.—The *Rotang Pajare* was first mentioned by Griffith in vol. V of the Calcutta Journal in 1845; afterwards by the same author in the "Palms of British East India"; it was considered by him to be related to *C.* (*Daemonorops*) *angustifolius*.

II.—Martius in the last pages of vol. III of his great work on Palms—pages that must have been published in the year 1849–50—proposed the name of *Daemonorops fasciculatus* for the *Rotang Pajare* of Griffith, agreeing with this author as to its similarity with *C. angustifolius*, which is a typical form of *Daemonorops*.

III.—H. Wendland in the Enumeration of the Palms in Kerchove de Denterghem's work (1878) not having accepted the genus *Daemonorops* and not being able to make use of the specific name of *fascicularis*, which had been already taken by *C. fascicularis* Roxb., proposed the name of *C. Fernandezii* in memory of Griffith's intelligent collector in the Malayan Peninsula.

IV.—Teysmann and Binnendijk, in the Catalogue of the Buitenzorg Garden for 1866, mention *C. Oxleyanus* as a native of Malacca and Bangka, which was afterwards described and figured under that name by Miquel (l. c.) in 1868. In this I at once recognised the *Rotang Pajare*, chiefly on account of the peculiar arrangement of the leaflets.

V.—*C. Oxleyanus* has nothing to do with a *Daemonorops*, being a well characterised species of *Calamus*; consequently its oldest name of *fasciculatus* cannot be retained; no more can that of *C. Fernandezii*, this last being more recent than the name *C. Oxleyanus*.

C. Oxleyanus is a highly characteristic species, being erect and at the same time being furnished with a powerful climbing apparatus, viz., the strongly clawed cirri; perhaps only with age the plant acquires a climbing habit. It is also distinguishable by the long petioles, and especially by the aggregation of its leaflets in remote groups of even 10–12, on each side, where the leaflets are equidistant and in one plane and not pointing different ways.

I have derived my description chiefly from the cultivated specimens which I have received from Buitenzorg: these have decayed male spadices and female ones with young fruit. Ridley's specimen has a portion of a female spadix with growing ovaries. I have not seen the mature seed.

PLATE 203.—Calamus Oxleyanus *Teysm. & Binnend.*—The upper part of a leaf-sheath with the petiole seen from below; an intermediate portion of a leaf (under-surface); the upper part of a female spadix with young fruit; a branchlet of a male spadix (in the lower part of the plate).—From a specimen in Herb. Becc. made from a plant cultivated at Buitenzorg.

174. CALAMUS MICROSPHÆRION Becc. in Perkins Fragm. Fl. Philipp. 45 et in Webbia. 349.

DESCRIPTION.—Scandent, slender. *Sheathed stem* about 15 mm. in diam. *Leaf-sheaths* gibbous above, cylindraceous, obliquely truncate at the mouth, quite unarmed green, sprinkled with very small punctiform brown scales. *Ocrea* very short, liguliform and narrowly bordering the mouth of the sheath. *Leaves* about 80 cm. long in the pinniferous part, the cirrus slender, with approximate half-whorls of small black-tipped claws; petiole 8–20 cm. long, flat above and round beneath with acute margins, smooth or very sparingly spinous; rachis smooth above, irregularly armed beneath along the middle and at the sides with small black-tipped claws; these solitary near the base and ternate higher up; leaflets numerous, grouped in many small alternate or sub-opposite fascicles of 2–4 on each side of the rachis, the fascicles separated by vacant spaces 5–10 cm. long; in each fascicle the leaflets are very approixmate by their bases and divergent, narrowly lanceolate, a good deal narrowed to the acute base, gradually acuminate at the summit into a finely subulate tip, thinly papyraceous, green and concolorous on both surfaces, 20–30 cm. long, 15–20 mm.

broad, 3- or sometimes sub-5-costulate; all the costae very slender and naked on both surfaces; transverse veinlets rather distinct in the upper surface, not very approximate, much interrupted. *Male spadix* . . . . . *Female spadix* inserted far below the mouth of its sheath, about as long as the pinniferous part of the leaves, simply decompound, with 5-6 partial inflorescences, and terminating in a filiform tail-like appendix, quite unarmed in every part; primary spathes elongate, closely sheathing, papyraceous, shortly opened at the summit on the ventral side and prolonged into a more or less elongate triangular point; the first flattened and rather acutely two-edged, the upper ones more cylindraceous; partial inflorescences ovate, panicled, spreading, inserted at the mouth of their respective spathes, the lower ones about 15 cm. long with 7–8 gradually diminishing spikelets on each side, the upper ones somewhat shorter and with fewer spikelets; secondary spathes tubular, slightly infundibuliform, closely sheathing, truncate at the mouth, apiculate at one side; spikelets inserted far above the mouth of their own spathes, spreading, filiform, the lower ones of each inflorescence about 5–6 cm. long with 10–12 flatly bifarious horizontal flowers on each side; spathels cylindraceous, slightly enlarged at the mouth, truncate, entire, glabrous, apiculate at one side; involucrophorum disciform, laterally attached at the base of the spathel above its own and quite exsert from this; involucre disciform, orbicular, very slightly concave, entire; areola of the neuter flower depressed, slightly callous, tumescent. *Female flowers* very small, about 2·5 mm. long, the calyx with 3 broadly triangular teeth; the segments of the corolla ovate, slightly longer than the calyx. *Fruiting perianth* distinctly pedicelliform with a flat base. *Fruit* very small, sphæric, shortly but distinctly beaked, of the size of a coriander seed (when nearly mature); scales in 18 longitudinal series, straw-yellow coloured with a red-brown marginal line, slightly channelled along the middle.

Habitat.—The Philippines, Halsey harbour in Culion Island, *Merrill* No. 507 Herb. Berol.

Observations.—Related to *C. ramulosus*, but easily distinguishable by its smooth leaf-sheaths, fascicled narrowly lanceolate leaflets, simply decompound spadix and very small round fruit. Like *C. ramulosus* by its natural affinities it ought to be included in the group with *C. aruensis*, but the involucrophorum is not pedicellate, and on this ground it has been placed rather artificially in the group with *C. inermis* where however all the species have very large fruit.

Plate 204.—Calamus microsphærion, *Becc.*—Portion of the sheathed stem with an entire fruit-spadix; basal portion of a leaf (under surface); summit of a leaf.—From Merrill's No. 507 in Herb. Berol.

175. Calamus ramulosus Becc. in Perkins Fragm. Fl. Philipp. 46, et in Webbia, 349.

Description.—Scandent, rather slender. *Sheathed stem* about 2 cm. in diam. *Leaf-sheaths* cylindraceous; gibbous above, obliquely truncate at the mouth, rather densely armed with scattered but somewhat regularly distributed spines which leave above them a deep impression on the surface of the sheath and are all of about the same size, light-coloured with a brownish tip, horizontal, subulate 8–15 mm. long. *Ocrea* very short, liguliform and forming a narrow rim to the mouth of the sheath. *Leaves* elongate in outline, about 1 metre long in the pinniferous part, terminating in a slender cirrus, this armed with approximate half-whorls of small black-tipped claws; petiole obsolete; rachis in the upper surface flattish near the base, angular upwards and more or less armed throughout with unequal and rather robust prickles; in the lower surface clawed along the middle; leaflets numerous, very distinctly approximate in many fascicles, each of these 3–7 cm. apart and formed on each side by 3–9 very approximate leaflets, the fascicles of one side often sub-opposite to those of the other side; furthermore the leaflets are thin in texture, subherbaceous, green and concolorous on both surfaces, linear, narrowed towards the base, gradually acuminate at the summit into a finely subulate tip, 20–25 cm. long, about 1 cm. broad with the mid-costa acute above, and this often accompanied there on each side by another secondary nerve and thence sub-3-costulate, all nerves naked on both surfaces; transverse veinlets remote, much interrupted, inconspicuous; margins very indistinctly and adpressedly spinulous; the upper leaflets gradually decreasing in size, less distinctly grouped and irregularly set. *Male spadix* . . . . . *Female spadix* inserted about midway on its sheath, 1 m. long with 6 partial inflorescences in one specimen and terminating in a slender filiform tail-like appendix; ultradecompound, much branched, panicled, loose, quite unarmed in every part; lowest primary spathe tubular, elongate, very closely sheathing, flattened, acutely two-edged; upper spathes more cylindraceous, closely sheathing, rather thin in texture, narrowed at the base into the flattened axial part, prolonged at the summit into a rather elongate acuminate point; partial inflorescences inserted at the mouth of their own spathes, diffusely panicled pyramidate, the lower ones the largest 30 cm. long with 6–7 gradually diminishing branchlets on each side, besides a few simple spikelets in the terminal parts, the lower branchlets 10–12 mm. long, pyramidal in outline, with 8–9 gradually diminishing spikelets on each side; secondary spathes very small, tubular-infundibuliform, scarious in their upper part, truncate and entire at the mouth and prolonged at one side into an erect triangular point; spikelets horizontally inserted above the mouth of their respective spathes, slightly arched, very slender, the larger ones, the lowest of each branchlet 4–5 cm. long, with 5–7 flowers on each side; spathes closely sheathing, tubular, slightly enlarged and exsuccous or subscarious in their upper part; involucre laterally attached at the base of the spathel above its own and quite exsert from this, cupular; involucre exactly cupular, entire; areola of the neuter flower lunate. *Female flowers* very small, 2·5 mm. long; the calyx with 3 broadly triangular lobes; the segments of the corolla barely narrower than the teeth of calyx and about as long. *Fruiting perianth* distinctly pedicelliform with a flat base. *Fruit* very small, when very young globular shortly beaked; scales in 15 longitudinal series, straw-yellow coloured with a red-brown marginal line, not channelled along the middle.

HABITAT.—The Philippines: Guinayangan, prov. Tayabas in Luzon, (*Merrill* No. 2070 in Herb. Berol.).

OBSERVATIONS.—This species is very distinct by its very narrow leaflets grouped in many very distinct fascicles and by the supradecompound very loose and much branched spadix with very small fruits. It shows remarkable affinities with the species of the group of *C. siphonospathus*, but the spathes are narrow and closely sheathing. Its nearer ally however is *C. microsphaerion*.

Plate 205.—Calamus ramulosus *Becc.*—Portion of a sheathed stem with the base of a leaf and an entire female spadix with very few flowers remaining upon it; branchlet with immature fruit (in the upper part of the plate); an intermediate portion of a leaf; the cirriferous summit of a leaf.—From Merrill's No. 2070 in Herb. Berol.

176. Calamus unifarius, H. Wendl. in Bot. Zeit. xvii (1859), 158; Miq. Fl. Ind., Bat. iii, 749 and De Palmis, 28; Becc. in Rec. Bot. Surv. Ind. ii, 212.

Calamus spp., Nos. 9 and 14, Zoll. Syst. Verzeichn. 79.

Description.—Scandent and robust. *Sheathed stem* 3–3·5 cm. in diam. *Leaf-sheaths* strongly gibbous above, obliquely truncate at the mouth, armed with very narrow, acicular, 1–3 cm. long, pale-brown or schistaceous, scattered, rather numerous, horizontal spines, which rest on a bulbous base and leave a distinct impression of their outline on the surface above them; these impressions are glabrous, while the spaces between them are thinly rusty-furfuraceous in the newly expanded leaves, later the entire surface is glabrous. *Ocrea* very shortly liguliform. *Leaves* large; those of the upper part of the adult plant cirriferous, 1·7 m. long in the pinniferous part; the cirrus armed very closely near the summit with black-tipped scattered or confluent, but not regularly half-whorled claws; petiole almost obsolete; rachis glabrous, in the first portion depressedly sub-biconvex, covered above with small, erect, short, scattered prickles, armed at the margins and sometimes also beneath along the middle with a few straight spines, which gradually pass higher up into claws, these solitary at first and then more or less confluent but not digitate or half-whorled, bifaced and smooth on the salient angle towards the summit in the upper surface; leaflets not very numerous, 15–20 on each side, the lower ones usually opposite, the others alternate, subequidistant and remote, 6–10 cm. apart and the terminal ones still more remote, lanceolate or lanceolate-ensiform, almost equally tapering towards both ends, acute at the base, acuminate at the summit into a bristly-spinulous tip, papyraceous, firm, plicate many-nerved, not or slightly concavo-convex, subconcolorous on both surfaces and green though dry, with 5 or even 7 slender costae which are slightly prominent in the upper surface, and naked on both surfaces except that of the centre above, which sometimes is sparingly bristly-spinulous near the summit and is furnished with 1–2 rigid spinules near its base; transverse veinlets very numerous, approximate, very minute; margins closely and adpressedly spinulous; the lower margin on the upper surface often bordered with a shining band; the largest leaflets, those a little above the base, 30–50 cm. long, 4–7 cm. broad; the upper ones gradually smaller; the two of the lowermost pair also small, spreading and slightly callous at their insertion. *Male spadix* ultra-decompound, elongate, 1 m.—1·5 m. or even 1·8 m. long, with 7–8 and in very vigorous specimens 10–11 partial inflorescences terminating in a slender, aculeolate, 10–20 cm.

long, flagelliform appendix; primary spathes fugaciously rusty-furfuraceous, thinly coriaceous, tubular, closely sheathing, entire, the first and in lesser degree the next one somewhat flattened and two-edged, the others more elongate, cylindraceous, slightly enlarged above, obliquely truncate at the mouth and prolonged at one side into a short triangular dorsally keeled and aculeolate point, more or less sprinkled, especially in the upper portion, with short straight horizontal or deflexed prickles; partial inflorescences inserted at or a little above the mouth of their own spathe, panicled pyramidate, the lower ones the largest, 20 cm., with numerous (10–12) distichous branchlets at their base and many simple gradually smaller spikelets upwards; upper inflorescences gradually decreasing in length and number of branchlets and spikelets; the largest branchlets 5–6 cm. long, with 7–8 spikelets on each side, branchlets and spikelets inserted outside, and sometimes far above, the mouth of their own spathe with a distinct axillary callus; secondary and tertiary spathes tubular-infundibuliform, papyraceous, unarmed, glabrous, finely striately veined, truncate, naked, entire and scarious at the mouth, shortly apiculate at one side; spikelets very slender, arched and deflexed, their axis filiform, 6–12 mm. long, with 5–10 distichous flowers on each side; spathels small, shortly tubular at the base and suddenly expanded into a bracteiform, ovate, acute, strongly deflexed limb; involucre exserted from its own spathel and laterally attached at the base of the one above, calyculiform, subtending and not enveloping its flower, very slightly concave, strongly veined more or less acutely 3-dentate. *Male flowers* ovoid, rather obtuse, 3 mm. long, entirely exsert from the involucre or with their base not immersed in this; the calyx shortly campanulate, striately veined, divided midway down into 3 very broad acute teeth; the corolla twice as long as the calyx, its segments opaque, striate outside. *Female spadix* simply decompound, otherwise similar to the male one; the largest partial inflorescences the lower ones, 15–30 cm. long, about 20 cm. apart, with 10–15 spikelets on each side; the upper ones much shorter, with 3–5 spikelets only on each side, inserted just at the mouth of their own spathe, spreading, rather dense, paniculate-pyramidate, their axis cylindraceous, rigid, slightly sinuous and gradually narrowing towards the summit; secondary spathes tubular, slightly enlarged above, horizontally truncate, entire and naked at the mouth, striately veined, not or very slightly apiculate at one side; spikelets slightly arched, horizontally inserted above the mouth of their own spathe with a distinct axillary callus, their axis rigid, slender, cylindraceous and slightly narrowed towards the summit; the lower ones, the largest, 5-8 cm. long with 15–20 bifarious flowers on each side; spathels cylindraceous at the base suddenly expanded into a short truncate entire naked and not laterally prolonged limb; involucrophorum very short, explanate, irregularly discoid, sessile and horizontally attached outside its own spathel about midway up the one above and, more or less distinctly callous at its axilla; involucre also explanate, irregularly discoid; areola of the neuter flower linear, depressed with a tumescent scar in the centre *Female flowers* flatly bifarious, horizontal, small, about 3 mm. long; the calyx with a flat base, campanulate, not or indistinctly striately veined, divided midway down into 3 very broad mucronulate lobes; corolla very slightly larger than the calyx, its segments acute, opaque outside. *Fruiting perianth* not accrescent, distinctly pedicelliform. *Fruit* globose or very slightly longer than broad, 1 cm. in diam., topped by a very short mucro with the remains of the very small stigmas; scales slightly squarrose or not very adpressed, in 15 series, shining, straw-coloured, not distinctly channelled along the middle, sometimes slightly depressed towards the point, this somewhat elongate, reddish-brown; margins erosely toothed. *Seed* irregularly globular 7 mm. long, deeply and coarsely pitted on the back, with a deep narrow chalazal fovea on the raphal side; albumen subruminate or with superficial intrusions of the integument; embryo basal.

HABITAT.—Java. The specimens distributed by Zollinger with No. 2305 (Herb. Boiss. and Delessert) were gathered on the Mount Semiru between 300–1,000 m. above the level of the sea. In the De Candolle Herbarium one specimen with immature fruit bears the No. 2302. In the Herbarium at Bruxelles another Zollinger's specimen with a male spadix bears the No. 1595 and was collected in the Botanic Garden at Buitenzorg.—Javan name "Bandil." Some specimens sent to the St. Petersburg Herbarium by Teysmann (and probably cultivated) are labelled "Rotang Tertas"; and others that I have received from Dr. Treub (cultivated) are named "Hoè Karok rok." One specimen of a leaf with its sheath, collected by Dr. Warburg in Sumbawa (Herb. Berol.) at 1,300 m., apparently belongs to *C. unifarius.*

OBSERVATIONS.—Distinguished in the group by the sheaths armed with scattered acicular bulbous spines; cirriferous leaves with remote subequidistant rather large lanceolate many-costulate leaflets; male spikelets slender; the involucre explanate subtending and not enveloping its flower; fruiting perianth small pedicelliform; fruit globose 1 cm. in diam.; scales subsquarrose not channelled along the middle; seed globular, coarsely pitted; embryo basal.—The affinities are with *C. pisicarpus, aruensis* and *Hollrungii.*

PLATE 206.—Calamus unifarius, *H. Wendl.*—Leaflets (under-surface) with portion of the rachis—from Zollinger's No. 2305 in Herb. Boiss.; portion of a male spadix in flower with an entire partial inflorescence,—from a specimen in St. Petersburg Herb.; portion of a spadix with immature fruit,—from Zollinger's No. 2302 in Herb. DeCand.; portion of a spadix with immature fruit; seeds, one in two halves cut through the embryo,—from Zollinger's No. 2305 in Herb. De Cand.

CALAMUS UNIFARIUS var. PENTONG Becc. in Hook. f. Fl. Brit. Ind. vi, 458 and in Rec. Bot. Surv. Ind. ii, 212.

DESCRIPTION.—*Female spadix* terminating in a rather elongate flagelliform appendix. *Involucrophorum* more or less distinctly pedicellate, very conspicuously callous at its axilla.—Other characters as in the type.

HABITAT.—The Nicobar Islands, from where Mr. *E. H. Man* forwarded to me a specimen of a female spadix with immature fruit under the native name of "Pentong." Another specimen of this variety is in the Calcutta Herbarium and was collected at Kamorta, also in the Nicobars, by *Kurz* in February 1875.

OBSERVATIONS.—Man's specimen of the fruit-spadix is accompanied by a non-cirriferous (radical?) leaf; the naked canes are 16–17 mm. in diam. with internodes about 25 cm. long. The surface is vitreous straw-yellow. The involucrophorum is very distinctly pedicellate in the basal portion of the female spikelets where also the involucre is somewhat stalked or slightly raised above the involucrophorum. The Calcutta specimen consists of a portion of a spadix with the fruit wanting and of the basal portion of a leaf with its sheath; this about 3 cm. in diam., strongly gibbous above and armed with many light-coloured solitary, short, 5–10 mm. long, acicular, horizontal, bulbous spines; the petiole reduced to nothing, the lowest pair of leaflets being inserted just at the mouth of the sheath; the first portion of the rachis flat at the base and convex upwards in the upper surface where densely covered with short straight erect spines and rather densely clawed beneath in the middle and at the sides; the portion of the pinniferous part seen by me (35 cm. in length) bears 6 leaflets on each side, which are subequidistant, subopposite, lanceolate, almost equally tapering towards both ends, subconcolorous, 5–7-costulate; the mid-costa spinulous, especially near the base, and the other nerves only occasionally sparingly spinulous above, all quite naked beneath; the largest leaflets 30 cm. long, 7 cm. broad; the apical part of the spadix rather elongate-flagelliform and more or less aculeolate; the primary spathes rather densely armed with very small and short subbulbous black-tipped prickles; the involucrophorum much more like that of the type, being sometimes almost sessile.

PLATE 207.—Calamus unifarius *var.* Pentong *Becc.* Naked cane; portion of a leaf (probably a radical one); the summit of a spadix with immature fruit.—From Man's specimen in Herb. Beccari.

177. CALAMUS SUBINERMIS H. Wendl., name only in Herb. Kew; Becc. in Rec. Bot. Surv. Ind. ii, 212.

DESCRIPTION.—Robust and very probably scandent. *Leaf-sheaths* 4 cm. in diam., thick and woody, strongly gibbous above, smooth (not striate or scabrid), altogether unarmed, light greenish (when dry), fugaciously ashy-furfuraceous, obliquely truncate and naked at the mouth. *Ocrea* very short (or deciduous ?). *Leaves* large, cirriferous, the only one seen by me 2·5 m. long in the pinniferous part, the cirrus robust 1 m. long, closely armed with half-whorls of robust black-tipped claws; petiole short (12 cm. long) and robust (15 mm. broad), rounded and unarmed beneath, flattish and smooth above, margins rather acute, armed with tuberculiform spinules rachis in its lower third-part armed like the petiole at the sides with spiny tubercles and naked beneath along the middle, and upwards beneath at first with remote solitary claws which become geminate and ternate and always more approximate towards the base of the cirrus; in the upper surface the rachis is flat and naked in its first portion, obtusely bifaced in the intermediate one and almost rounded at the summit; petiole, rachis and cirrus glabrous and almost polished, very indistinctly longitudinally striolate; leaflets not very numerous (16–17 on each side), subequidistant, remote (10–15 cm. apart), alternate or subopposite, elongate-lanceolate, a good deal narrowed to and strongly plicate at the base, gradually acuminate at the summit into a densely bristly tip, papyraceous, green, opaque on both surfaces, slightly paler beneath, plicate, many-nerved with 5 distinct acute costae, these furnished with black spiny bristles above; beneath all nerves smooth; transverse veinlets delicate, rather approximate; margins rather closely and adpressedly ciliate-spinulous; the largest leaflets, those of the intermediate part, 50–60 cm. long 5–5·5 cm. broad; the upper ones gradually smaller, the extreme 30 cm. long, 3·5 cm. broad. *Spadices* unknown.

HABITAT.—Borneo, probably in Sarawak, *Low* in Herb. Kew.

OBSERVATIONS.—Of this large species I have seen only an entire leaf with its sheath, this completely unarmed,—a rare occurrence in the genus. Its affinities are doubtless with the species of the group of *C. palustris*, and its nearest ally seems to be *C. unifarius*, from which it chiefly differs in the unarmed leaf-sheaths and short petioles, which are smooth above and, as the first portion of the rachis, armed with tubercular spines at the sides.

PLATE 208.—Calamus subinermis *H. Wendl.* Leaf-sheath with base of the leaf; first portion of the leaf (upper surface); one of the largest leaflets; the cirriferous summit.—From Low's specimen in the Herb. Kew.

178. CALAMUS PISICARPUS Bl. Rumphia, iii, 39; Mart. Hist. Nat. Palm. iii, 340; Walp. Ann. iii, 490 and 832; Miq. Fl. Ind. Bat. iii, 132 and De Palmis, 28; Becc. Malesia i, 88 and Rec. Bot. Surv. Ind. ii, 212.

C. oblongus β. Bl. in Roem. and Schult. Syst. Veg. iii, 2, 1324 (as to cit. Herb. Amb. only, excl. the Javan plant which belongs to *Daemonorops oblongus* Bl.

C. verus (not of Lour.) Mart. Hist. Nat. Palm. 209, 1st edit. (partly).

Palmijuncus verus latifolius Rumph. Herb. Amb. v, 106, 2, t. 55, f. 1.

DESCRIPTION.—Scandent and robust, naked canes about 2·5 cm. in diam. almost cylindric or superficially costate with internodes about 30 cm. long. *Leaf-sheaths* green, armed with long straight spines. *Leaves* cirriferous, large; petiole very short, the pinniferous part 1·5 m. long, cirrus 2·5–3 m. long, very robust, strongly clawed; rachis armed with short aculei, leaflets alternate, scattered (inequidistant ?), lanceolate, acuminate, 35–40 cm. long and about 5 cm. broad, plicately many-costate with the mid-costa bristly-spinulous. *Male spadix* . . . . . *Female spadix* 1·8 m. long, nodding or reflexed, non-flagelliferous, with many (8 in the plate) remote partial inflorescences; these scorpioid, bearing many distichous alternate, slender spikelets; involucrophorum shortly pedicelliform. *Fruiting perianth* pedicelliform. *Fruit* very small, almost sphaeric, pisiform, apiculate. *Seed* globose.

HABITAT.—Amboina. Rumph writes that it is common near the river Basso (or Passo ?) Bagualena, where it was known by the name of "Rotang Way or (Ua) Ory," and that it grows at the foot of the mountains in the country of Hitu, Laha near Way. It receives also the names of "R. Tuni Daun Besar," "R. Bulu" or "Ua Lou Cana." According to Rumph it is employed for many uses, such as walking sticks, handles for lances, and principally for ropes because of the facility with which it is bent and twisted.

OBSERVATIONS.—Nobody after Rumphius has found this species again which, however, I consider a very distinct one. It bears very considerable affinities with

C. aruensis Becc. and *C. Holrungii* Becc. differing from the first in its leaf-sheaths strongly armed and from the second in the leaflets with the midcosta spinulous above and in the smaller fruit. From *C. unifarius* it apparently differs only in the smaller fruit.

179. CALAMUS ARUENSIS Becc. Malesia, iii, 61, and in Rec. Bot. Surv. Ind. ii, 212.

Calamus sp. No. 45, Becc. Malesia, i, 88.

DESCRIPTION.—Robust, scandent. *Sheathed stem* 3–4 cm. in diam. *Leaf-sheaths* not flagelliferous, very thick, almost woody, strongly gibbous above, obliquely truncate, at the mouth, greenish even when dry, totally unarmed. *Ocrea* very short, liguliform, naked. *Leaves* large, quite epetiolate, about 2 metres long in the pinniferous portion and terminating in a long, rather irregularly clawed cirrus ; rachis, in its lowest part near the vagina, very robust, nearly 2 cm. broad, quite unarmed, flattish above, a little higher up slightly biconvex and from about the middle to the summit more or less bifaced and naked above, flat and armed beneath along the middle, and sparingly also at the sides, with solitary claws ; leaflets not very numerous, about 30 in all, equidistant, usually alternate, 10–15 cm. apart on each side ; very firmly papyraceous, green even when dry, shining above, slightly paler beneath, quite glabrous and smooth on both surfaces, large, broadly lanceolate, almost equally narrowed towards both ends, acute at the base, where distinctly callous beneath in the sinus formed by the plicature of the blade at its insertion, acuminate at the summit into a spinulous tip, plicate, many-nerved, with 5 acute and strong costae and other minor but distinct secondary nerves ; all naked on both surfaces ; transverse veinlets very fine, excessively numerous and very approximate and continuous ; margins smooth in the lower third-part, adpressedly spinulous upwards ; the spinules more spreading and more numerous towards the summit, the lower one in the upper surface bordered with a narrow polished band ; the largest leaflets, those a little above the base, 40–50 cm. long, 7–8·5 cm. broad ; those towards the summit gradually smaller and more remote ; the first pair deflexed, strongly callous at the base, inserted just at the mouth of the sheath and very small (15 cm. long and 15 mm. broad). *Male spadix* . . . . . *Female spadix* not very large, rather rigid and straight ; the portion seen by me, which is without the base, is 1·1 metre long, including a terminal subflagelliform, slender, sparingly prickly, tail-like, 25 cm. long appendix and with 4 partial inflorescences ; upper primary spathes elongate, tubular-cylindraceous or very obsoletely angular, slightly larger at the base than at the summit, rather closely sheathing, finely longitudinally striate, obliquely truncate, entire and naked at the mouth, slightly prolonged at one side into a short dorsally keeled, triangular point, totally smooth, with the exception of a few hooked prickles near the summit, very suddenly narrowed at the base into a very flattened unarmed axial portion ; partial inflorescences inserted just at the mouth of their own spathe, spreading, strongly arched, their axis robust at the base, gradually narrowing towards the summit and terminating in a very small, inconspicuous, short, smooth caudiculum ; the larger ones the lowest, 20 cm. long with 8 spikelets on each side ; the uppermost shorter with half that number of spikelets ; secondary spathes very thinly and fugaciously rusty-furfuraceous, tubular-infundibuliform, rather loosely sheathing, gradually smaller from the base towards the summit of the axis, horizontally truncate, entire and naked at the mouth, very shortly apiculate at one side, unarmed; spikelets arched, their axis cylindraceous, narrow, rigid, subulate, horizontally inserted a little above the mouth of their own spathe with a more or less distinct axillary callus; the larger ones, the lowest, 8–9 cm. long, with 20–25 flowers on each side; the uppermost about one-half shorter; spathels shortly infundibuliform, truncate and entire at the mouth, slightly apiculate at one side, more or less distinctly two-keeled on the side of the insertion of their respective flowers; involucrophorum suborbicular-discoid, very shortly stalked or with a short neck or even subsessile, laterally inserted outside its own spathel at the base of the one above; involucre discoid, orbicular, almost explanate; areola of the neuter flower very depressed, linear. *Female flowers* very small, about 3 mm. long, horizontally inserted. *Fruiting perianth* distinctly pedicelliform; the calyx depressedly ventricose, flat at the base, its teeth broadly triangular; the segments of the corolla as long as the calyx and almost as broad as its teeth. *Fruit* (not quite mature) very small, almost sphaeric, 5 mm. in diam., very indistinctly apiculate; the very small stigmas sessile; scales very small in 15 series, shining, dirty-straw-coloured, very faintly channelled along the middle, slightly prolonged into a not very adpressed and often darker point, margin erosely toothed. *Seed* not seen quite mature.

HABITAT.—The Aru Island at Jabu-lengan, collected by me in May 1873.

OBSERVATIONS.—Related to *C. pisicarpus* and *C. Hollrungii*, distinct by its quite unarmed leaf-sheaths; the large epetiolate leaves; the rachis clawed beneath, otherwise totally smooth above from its insertion; the broadly lanceolate equidistant leaflets which have 5 primary acute costae and many distinct secondary nerves, all naked on both surfaces; the spikelets with numerous horizontally inserted flowers; the involucrophorum shortly stalked; the fruit small pisiform.

PLATE 209.—Calamus aruensis *Becc.* Basal portion of a leaf with its leaf-sheath; upper part of a spadix with young fruit.—From the type-specimen in Herb. Becc.

180. CALAMUS HOLLRUNGII Becc. in Schum. and Hollr. Die Flora von Kaiser Wilhelmsland, 17; Schum. and Laut. Fl. deutschen Schutzg. in der Südsee, 203 (partly)?; Becc. in Rec. Bot. Surv. Ind. ii, 212.

DESCRIPTION.—Scandent and apparently rather robust. *Leaf-sheaths* . . . . . *Leaves* large (not seen entire); petiole . . . . . (probably very short); rachis very robust, flat and smooth beneath in its first portion where densely armed above with straight, erect 4–6 mm. long prickles; the portion above the middle also flat beneath where closely armed at the sides with small recurved prickles and smooth along the middle; the upper surface gradually becoming more distinctly bifaced towards the summit, spinulous on the salient angle; leaflets not very numerous, subequidistant, usually alternate, 6–10 cm. apart, very firmly papyraceous, greenish-yellow when dry, slightly paler beneath, broadly lanceolate, usually broadest below the middle, more gradually acuminate towards the summit than at the base, where acute, distinctly callous beneath in the sinus formed by the backward folding of the blade at its insertion, tip rigid with spreading subspiny bristles at the sides, plicate many-nerved, with 5 acute and strong costae and other minor but distinct secondary nerves, all naked on both surfaces, except on the mid-costa above near the base, where a few rigid spinules occasionally occur; transverse veinlets fine, numerous and continuous; margins rather spreadingly spinulous from the middle upwards, the lower one in the upper surface bordered with a narrow polished band. *Male spadix* . . . . . *Female spadix* elongate, rather large, decompound, with many partial inflorescences; upper primary spathes elongate, tubular-cylindraceous, closely sheathing very thinly and fugaciously rusty-furfuraceous, thinly coriaceous, finely and indistinctly longitudinally striate, quite unarmed, obliquely truncate, entire and naked at the mouth, where slightly prolonged at one side into a short triangular erect point; very suddenly narrowed at the base into a robust obsoletely angular unarmed axial portion; partial inflorescences strongly arched, their axes robust at the base, gradually narrowing towards the summit; the largest seen by me 40 cm. long with about 15 spikelets on each side; the upper ones much smaller; secondary spathes tubular-infundibuliform, rather loosely sheathing, gradually smaller from the base towards the summit of the axis, horizontally truncate, entire and naked at the mouth, very shortly apiculate at one side, unarmed; spikelets horizontally attached above the mouth of their own spathe with a distinct axillary callus, elongate, slightly sinuous, their axis cylindraceous, narrow, rigid, subulate; the lower ones, the largest, 10–12 cm. long with 20–25 flowers on each side; the upper ones shorter with half that number of flowers; spathels slightly infundibuliform, horizontally truncate and entire at the mouth, very shortly apiculate at one side; involucrophorum orbicular, discoid, shortly stalked or with a more or less distinct neck, laterally inserted outside its own spathel at the base of the one above; involucre discoid, orbicular, almost explanate; areola of the neuter flower very depressed, linear. *Female flowers* very small, about 3 mm. long, horizontally inserted. *Fruiting perianth* shortly but distinctly pedicelliform; the calyx depressedly ventricose, flat at the base, its teeth broadly triangular; the segments of the corolla as long as the calyx and almost as broad as its teeth. *Fruit* (when very young) subsphaeric-pisiform, very indistinctly apiculate; the very small stigmas sessile; scales small in 15 series, shining, of a dirty straw-colour the margins scarious, erosely toothed, tip not very adpressed.

HABITAT.—German New Guinea at Augusta station, *Hollrung* No. 667 in Herb. Berol. and Beccari.

OBSERVATIONS.—Very closely related to *C. pisicarpus* and *C. aruensis*, but at once distinguishable by the leaf-rachis covered in its upper surface with numerous erect straight spinules.

The type-specimen has an intermediate portion of a female spadix with very young fruit, 1·2 m. long, but to this specimen and with the same number were joined a few mature fruits which apparently belong to the same species. They are very broadly ovoid, rounded at both ends, indistinctly apiculate, 12 mm. long, 9 mm. broad, the scales in 15 series, shining, slightly channelled along the middle, straw-coloured with a reddish-brown intramarginal line, this somewhat extended towards the apex, which is triangular and not very adpressed, margins narrowly scarious, erosely toothed. *Seed* orbicular, slightly flattened on the raphal side with a central round and rather deep chalazal fovea, deeply pitted and convex on the back, 7 mm. broad, 5·5 mm. thick; albumen equable; embryo basal.

PLATE 210.—Calamus Hollrungii *Becc.* Portion of a leaf from near its base upper surface; intermediate portion of a leaf, under surface; portion of the spadix with an entire partial inflorescence bearing immature fruit; detached mature fruit and seed.—From Hollrung's No. 667 in Herb. Becc.

181. CALAMUS VIDALIANUS Becc. in Rec. Bot. Surv. Ind. ii, 212, et in Webbia, 350.

C. horrens? Vidal Rev. Plant. Vasc. Filip., 280 (not of Bl.) and exsicc. No. 938 !

DESCRIPTION.—Probably scandent and of moderate size. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* not seen entire, but probably cirriferous; petiole . . . . . (apparently very short); rachis in its basal portion slightly convex above, where very densely covered with unequal spines, some of them very short and tuberculiform, whereas others are 10–12 mm. long, scattered, solitary or aggregate, straight and erect on the surface or slightly deflexed, subulate, brownish with a light base, rather closely armed at the sides with slightly hooked prickles, slightly convex and quite smooth underneath; leaflets in the small basal portion seen by me inserted along a narrow longitudinal furrow at the side of the rachis, subequidistant, 3–5 cm. apart, alternate or subopposite, papyraceous, rigidulous, glabrous, rather opaque, subconcolorous on both surfaces, narrowly ensiform, gradually tapering towards a very narrow base, acuminate from the middle into a setose apex, 30–32 cm. long, 15–20 mm. broad, with 3 bristly-spinulous very distinct costae above; underneath, the nerves tenuous and naked; transverse veinlets very slender, rather crowded; margins ciliate with spreading rather strong spinules, the lower one in the upper surface bordered by a shining stripe. *Male spadix* . . . . . *Female spadix* decompound, apparently large and diffuse (not seen entire), terminating in a small slender tail-like, sheathed, aculeolate appendix (this 9 cm. long), with many approximate partial inflorescences; primary spathes (the lowermost not seen by me) tubular-cylindraceous, closely sheathing, slightly enlarged above, thinly coriaceous, greenish (when dry), almost polished, sprinkled with small brown scales (visible under a lens), entire and truncate at the mouth, where prolonged at one side into a triangular dorsally keeled and sparsely aculeolate point, otherwise unarmed; partial inflorescences inserted at the mouth of their own spathe with a distinct axillary callus, the largest amongst the few of the upper part of the spadices seen by me, 20 cm. long, with 4–5 distichous spikelets on each side; secondary spathes sprinkled with brown scales, unarmed, elongate-infundibuliform, narrowed towards the base, where flat or slightly concave on the inner side, rounded on the back, obliquely truncate at the mouth, scarious and ciliate-paleaceous at the mouth, slightly prolonged at one side into an acute point; spikelets inserted just at the mouth of their own spathe with a distinct axillary callus, arched, spreading, 5–7 cm. long with about 6 flowers on each side; the upper ones somewhat shorter; spathels infundibuliform, narrowed a good deal towards the base, sparsely scaly-furfuraceous, superficially striately veined; scarious-ciliolate and erose at the margin, prolonged at one side into a triangular acute point; involucrophorum almost entirely exsert from its own spathel and laterally attached at the base of the one above with a distinct axillary callus next to the axis, shallow, concave, posticously acutely bidentate; involucre shallowly cupular, slightly exceeding the involucrophorum, emarginate and acutely bidentate on the side of the neuter flower; areola of the neuter flower distinctly lunate, sharply bordered and sometimes somewhat concave and subinvolucriform. *Female flowers* rather remote, about 5 mm. long, conic-ovoid, narrowing towards the summit; the calyx very shortly and acutely 3-toothed with a slightly ventricose tube, smooth, thickened and subcoriaceous at the base; the corolla as long as the calyx, divided a little beyond midway into 3 lanceolate acute segments, smooth or indistinctly striately veined outside; staminal urceolum reaching to about the middle of the corolla, and crowned by 6 triangular short teeth; sterile anthers deeply sagittate; ovary shortly pedicellate; style short, thick, conic; stigmata small recurved. *Fruit* unknown.

Habitat.—Luzon in the Philippines, at Unisan in the Prov. of Tayabas, *Vidal* No. 933 in Herb. Kew.

Observations.—Of this I have seen only the summit of a female spadix in flower and a portion of a leaf with 20 cm. of rachis, probably from near the base.

It appears related to *C. pachystachys* and *C. didymocarpus*; distinguishable by its rachis densely prickly in its upper part and the narrow, ensiform, equidistant leaflets with 3 bristly costae above and naked beneath; apparently from the conspicuous development of the areola of the neuter flowers, sometimes two almost equal flowers occur at one spathel.

Plate 211.—Calamus Vidalianus *Becc.*—Portion of a leaf from near its base, seen from the upper surface; portions of the female spadix in flower.—From Vidal's No. 933 in Herb. Kew.

182. Calamus pachystachys Warb. (name only in Herb. Berol.).

Description.—Robust, scandent. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* rather large (not seen entire by me), terminating in a robust but apparently not very long cirrus; this dreadfully armed with half-whorled or even solitary, stout, light-based and black-tipped claws; petiole . . . . .; rachis in its first portion biconvex, armed above with rather robust, 5–6 mm. long, straight, erect spines and beneath along the middle with solitary, long-tipped claws (which leave a deep impression of their outline on the surface of the rachis) and with a few other spines at the sides; in the upper portion the rachis is bifaced and naked above, and beneath is usually armed along the middle with long and robust claws, which are solitary at first and then when nearer to the terminal cirrus more or less confluent, binate or ternate with solitary ones irregularly interposed amongst them; leaflets rather numerous, inserted at a rather acute angle, equidistant, not very closely set (about 4 cm. apart), papyraceous, very rigid, glabrous, concolorous and shining on both surfaces, longitudinally plicate, narrowly lanceolate, somewhat alternate towards the base where plicate with a more or less distinct callus beneath inside the folding at their insertion;

from their lower third-part upwards gradually acuminate into an obtuse and at the summit spinulous point, their mid-costa solitary, acute and prominent above where sparingly bristly spinulous only near the summit, superficial and naked beneath; side-nerves slender and naked on both surfaces; margins very conspicuously ciliated with spreading, rather approximate and long bristly spinules; the lower one slightly thickened by a nerve; transverse veinlets crowded and fine. *Male spadix* . . . . . *Female spadix* not seen entire by me but seemingly rather large and robust; in one specimen a partial inflorescence is about 40 cm. long, rigid and robust, and terminates in a tail-like, rigid, almost unarmed appendix and bears 3-4 spikelets on each side; primary spathes . . . . .; secondary spathes quite smooth, tubular-infundibuliform, thinly coriaceous, 4–5 cm. long, more or less sprinkled with fuscescent furfuraceous scales, narrowed a good deal towards the base, where flat on the inner and convex on the outer side and with sharp margins, truncate and entire at the mouth, prolonged at one side into a broad and short triangular point; spikelets thick, subterete-vermiform, attached at the mouth of their respective spathe, not or indistinctly callous at their insertion, strongly arched, terminating in a very short rigid caudiculum, the lower ones, the largest, about 15 cm. long with 7 pairs of flowers on each side; spathels tubular-infundibuliform, somewhat narrowed towards the base, horizontally truncate and entire at the mouth, sprinkled with fuscescent furfuraceous scales, apiculate at one side, usually subtending two perfectly equal female flowers, or sometimes near the summit of the spikelet only one; involucrophorum attached at the base of the spathel above its own, short, subcupular, transversely broader, two-keeled, bidentate and emarginate on the side next to the axis; involucres geminate, cupular, with a short and truncate limb, superficially bidentate, with the margin lunately excavate on the inner side where the involucres are in contact, but with a small cavity between the two. *Female flowers* narrowly ovate; the calyx slightly ventricose with 3 short triangular teeth; the segments of the corolla narrower than the lobes of the calyx and not quite as long. *Fruiting perianth* very distinctly pedicelliform, cylindraceous, 3–3·5 mm. thick. *Fruit* when almost ripe subglobose-ovoid subturbinate or slightly tapering towards the base, suddenly contracted at the summit into a small conical acute mucro, 15-17 mm. long, including the mucro and the caudiculum, 10–12 mm. broad; scales shining, in 17–18 series, brownish or reddish-yellow, strongly convex and deeply channelled along the middle, with a short point and a narrow almost black intramarginal line; the margin erosely toothed. *Seed* globular, about 11 mm. long and 9 mm. thick, very similar to that of *C. didymocarpus;* albumen deeply ruminate; embryo placed slightly above the base.

HABITAT.—Celebes, at Wawo Kraeng on the high mountains in the southern part of the Island, *Warburg* in Herb. Berol.

OBSERVATIONS.—This is a very near ally of *C. didymocarpus*, but its leaflets are a good deal smaller and more distinctly lanceolate; the spadices more robust, more rigid and shorter; the spikelets more rigid and thicker and the fruit is conically beaked. The female flowers are almost constantly geminate at each spathel except near the summit of the spikelets where sometimes they are solitary; when this is the case on the outer side of the involucre occurs a very distinct and sharply bordered areola for the neuter flower. Besides *C. pachystachys* and *C. didymocarpus*, another species from New Guinea, very imperfectly known (*C. fertilis* Becc.), has geminate female flowers at each spathel, but in this the seed is not ruminated, and evidently it belongs to a different group from the two mentioned above, which apparently are akin to *C. Vidalianus.* In this also I have found sometimes two female flowers, but I have not seen the two exactly equally evolute.

Of *C. pachystachys* I have seen a partial inflorescence with almost ripe fruit, and an almost entire leaf, 80 cm. long in the pinniferous portion, with the rachis 8 mm. thick at its base.

PLATE 212.—Calamus pachystachys *Warb.* Upper portion of a leaf and its terminal cirriferous summit; partial inflorescences of a spadix with almost mature fruit.—From Warburg's type-specimen in Herb. Berol.

183. CALAMUS DIDYMOCARPUS Warb. (name only in Herb. Berol.)

DESCRIPTION.—Scandent, robust. *Stem* . . . . . *Leaf-sheaths* . . . . . *Leaves* large (only the summit of one seen by me) terminating in a robust cirrus, which is 2 metres in length and fearfully armed with rather approximate half-whorls of very acuminate and robust black-tipped claws; these often intermingled with others solitary or more or less aggregate and irregularly set; petiole . . . . . ; rachis in its upper portion bifaced above with acute and smooth angle, rather convex beneath, where strongly armed with half-whorls of claws as on the cirrus; leaflets of the summit of the pinniferous part remotely inserted (8–10 cm. apart), the largest of these, the lower ones 43 cm. long, 4 cm. broad, the upper ones narrower and shorter, papyraceous, firm in texture, somewhat longitudinally plicate, green even when dry, glabrous, concolorous and shining on both surfaces, lanceolate-ensiform, almost equally narrowed towards both ends, more or less callous in the axilla at their insertion, gradually acuminate from the middle upwards into a not very acute and at the sides bristly-spinulous tip; the mid-costa rather acute and prominent above where sparingly bristly-spinulous, superficial and naked beneath; secondary nerves numerous, slender but rather distinct and naked on both surface; transverse veinlets very fine, sinuous and close together; margins slightly thickened by a nerve and ciliate mainly near the summit with short rather spreading and rather approximate spinules. *Male spadix* . . . . . *Female spadix*, judging from the portion seen by me, large and diffuse; primary spathes . . . . .; a partial inflorescence (the only one seen by me) about 1 metre in length, comparatively slender, with 6–7 spikelets on each side, secondary spathes tubular, slightly infundibuliform, 6–7 cm. long, closely sheathing, armed chiefly on the outer side near the base with numerous, small, broad-based, black-tipped claws and covered with very numerous and confluent rusty scales, narrowed a good deal towards the base into an axial portion, which is convex on the outer and flat on the inner side, entire, truncate and naked at the mouth, prolonged at one side into a short triangular acute point, sometimes with a smaller but similar point on the other side and therefore subbilabiate; spikelets inserted above the mouth of their respective spathe with a rather distinct axillary callus, elongate, vermicular, flexuose, the lower ones the largest, even 25 cm. long, with 18 female flowers (or pairs of female flowers) on each side; the upper ones somewhat shorter; spathels tubular-infundibuliform, somewhat narrowed towards the base, unarmed, scaly-furfuraceous, horizontally truncate and entire at the mouth, slightly prolonged at one side into a short striately veined point; involucrophorum exsert from its own spathel and laterally attached at the base of the one above, short, cupular, two-keeled, bidentate and lunately excavate on the margin on the side next to the axis; involucres (when the flowers are two at each spathel, as it is usual in this species) geminate, equal, shallowly cupular, each slightly lunately excavate on the inner side, where they are in contact and where sometimes occurs a small intermediate cavity with a central scar, apparently the insertion of a neuter flower; when only one involucre occurs at each spathel, it has externally a very large lunate sharply bordered areola. *Female flowers* usually geminate at each spathel, about 5 mm. long, narrowly ovate; the calyx tubular, slightly ventricose, with 3 short triangular, acute teeth; segments of the corolla acute, narrower than the teeth of the calyx and barely longer than these. *Fruiting perianth* very distinctly pedicelliform, cylindraceous, 3·5–4 mm. thick, the calyx hardened, not striately veined, scaly-furfuraceous. *Fruit* subglobose-obovoid and sometimes subturbinate or slightly tapering towards the base, rounded above where very suddenly topped by a 2 mm. long cylindric beak, caudiculate at the base, 17–18 mm. long, including the beak and the caudiculum, and 12–14 mm. broad; scales in 15 series, straw-coloured, shining, strongly convex, channelled along the middle, with an obtuse tip, bordered all round with a very dark line, the margin erosely toothed. *Seed* globular, 8–9 mm. in diam., covered by the very adherent integument, superficially pitted and tubercled; albumen deeply and rather finely ruminate; chalazal fovea indistinct; embryo placed slightly above the base.

HABITAT.—North Celebes; at Bojong in the Province of Minahassa, *Warburg* in Herb. Berol.

OBSERVATIONS.—Very closely related to *C. pachystachys* from which it differs in the more diffuse spadix with larger more slender, nodding partial inflorescences; the leaflets much larger; the fruit with a cylindric (not subconic) beak; the secondary spathes rather densely armed; the female flowers are usually geminate at each spathel and often but not always both fertile; on some spikelets, however, there is only a female flower accompanied by a sterile one. Another specimen of the summit of a leaf and of a portion of a flowering female spadix preserved in the Herbarium at Berlin and collected also by Warburg at Tjamba Manipa in South Celebes apparently belongs to *C. didymocarpus;* the leaf has the leaflets narrower than in the type-specimen, 17–18 mm. broad and 33–34 cm. long, 5 cm. apart and subequidistantly set. This, like *C. pachystachys,* seems related to *C. Vidalianus*, but this has distinctly 3-costate bristly leaflets.

PLATE 213.—Calamus didymocarpus *Warb.* The summit of a leaf (under surface); an entire partial inflorescence; detached fruits; seed entire and longitudinally cut through the embryo.—From Warburg's specimen in Herb. Berol.

184. **CALAMUS MELANOLOMA** Mart. Hist. Nat. Palm., iii 207, (first. edit.) and 209 (2nd edit.) and 339, t. 116, f. iii; Kunth Enum. Pl. iii, 206; Walp.

Ann. iii, 489 and v, 831; Miq. Fl. Ind. Bat. iii, 129; Teysm. Cat. Hort. Bog., 75; H. Wendl. in Kerch. Les Palm., 237; Becc. in Rec. Bot. Surv. Ind. ii, 213.

C. anceps Bl. Cent. Plant. Nov. (ined.) and Rumphia, iii, 65, t. 149.

C. calolepis Miq. Pl. Jungh., 159 and Fl. Ind. Bat. iii, 130, and De Palmis, 28.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 7–12 mm. in diam. *Leaf-sheaths* not flagelliferous, obliquely truncate at the mouth, green (though dry), more or less furfuraceous, ultimately glabrous, gibbous above, armed with solitary, scattered, horizontal or slightly deflexed, straight, usually 2–5 more rarely 10 mm. long, broad-based, subulate spines. *Ocrea* short, glabrous, smooth, liguliform. *Leaves* small, 30-50 cm. long in the pinniferous portion; the cirrus about as long, slender, filiform, irregularly armed with solitary, more or less aggregate and more rarely half-whorled claws; petiole very short, 10 mm. long at most, 3–5 mm. broad, flat above, rounded beneath, where armed with a line of solitary claws along the middle; the margins acute, smooth or sparingly aculeolate; rachis rounded below where armed as usual at first with solitary and higher up with geminate and then ternate claws, flattish in its first portion above, where speedily becoming bifaced with an acute and smooth salient angle; leaflets few, 10–20 in all, inequidistant, usually in remote pairs on each side of the rachis (the pairs alternate or subopposite), all about of the same size or the medial a little larger than the others, 10–12 cm. long, 1·5–2·5 cm. broad, papyraceous, rather firm, green even when dry, paler beneath, lanceolate or oblanceolate, tapering towards and acute at the base, acuminate from above the middle into a rather long narrow bristly-spinulous tip, 3- or sub-5-costulate, the mid-costa acute, the side costae very slender, all naked on both surfaces and less distinct beneath; transverse veinlets fine, not very crowded, continuous; margins minutely and adpressedly spinulous, more spreadingly at the summit. *Male* and *female spadices* very similar, very simple, erect, inserted far below the mouth of the sheath and bearing simple, or the male sometimes branched, spikelets at each primary spathe. *Male spadix* 30–40 cm. long, with 5–6 spikelets on each side, of which the lower ones sometimes branched or furnished on each side at their base with 1–3 secondary spikelets; primary spathes more or less rusty-furfuraceous, almost unarmed or sparsely aculeolate, otherwise smooth, tubular, slightly enlarged above, entire, obliquely truncate at the mouth, narrowly scarious and ciliolate at the margin and prolonged at one side into an acute or acuminate point; the first flattened with acute and prickly edges; the succeeding one also somewhat flattened; the upper ones more cylindraceous; spikelets inserted at the mouth of their own spathe, horizontal, slightly arched; the lower ones, the largest, 5–7 cm. long., bearing 6-9 distichous very patent remote flowers on each side; spathels infundibuliform, narrowed a good deal towards the base, striately veined, ciliate at the mouth, conspicuously prolonged at one side into a large spreading acute point, this subtending a flower; the secondary spikelets smaller, with more closely packed flowers and shorter and more crowded spathels; involucre laterally adnate to the base of the spathel above its own, shallowly cupular, acutely bidentate on the side next to the axis. *Male flowers* oblong-ovoid, somewhat tapering towards the summit, acute, obsoletely trigonous, 6 mm. long, 3 mm. thick; calyx tubular;

campanulate, subcoriaceous, green, striately veined, its teeth triangular acute; corolla about a third longer than the calyx, divided almost from the base into 3 ovate-lanceolate, acute, concave, cartilaginous, externally rather polished segments; stamens with filaments as long as the corolla, subulate with inflexed apices in the bud; anthers versatile, linear-sagittate, attenuate towards the apex; rudimentary ovary consisting of 3 small obtuse papillae. *Female spadix* exactly like the male, sometimes perhaps smaller and with fewer spikelets (2–4 on each side); primary spathes as in the male spadix; spikelets very similar to the male ones, 5–6 cm. long, with 5–6 very spreading or horizontal flowers on each side; the uppermost somewhat shorter and with fewer flowers; spathels as in the male spikelets; involucrophorum subtended by the point of its own spathel and laterally attached to the base of the one above, shallowly cupular, acutely bidentate and bicarinate on the side next to the axis, ciliolate at the margin, excavate on the side of the neuter flower of which the areola is comparatively large and lunate. *Female flowers* small, 3 mm. long; the calyx divided midway down into 3 ovate acute lobes; segments of the corolla as long as but narrower than the lobes of the calyx; staminal urceolum reaching about to the middle of the corolla, and crowned by 6 short teeth; anthers very small; ovary oblong; stigmas subsessile, subulate-trigonous, speedily recurved. *Fruiting perianth* distinctly pedicelliform somewhat narrowed towards the base. *Fruit* 18–24 mm. long, 10–15 mm. broad, elongate-ellipsoid, equally rounded at both ends, caudiculate at the base, topped by a very distinct cylindric narrow beak; scales in 15–18 series (22, Blume), shining, faintly channelled along the middle, straw-coloured with an almost black marginal line which broadens towards the somewhat prolonged obtuse point; margins acute, finely erosely toothed. *Seed* narrowly oblong, equally rounded at both ends, 11–12 mm. long, 6 mm. thick, with deep narrow pits on the back; chalazal fovea narrow and deep in the centre of the raphal side; albumen ruminate near the periphery, homogeneous in the centre; embryo basal.—All parts of the plants have a light-green colour when dry.

HABITAT.—On the high part of the volcanoes in West Java; on the Salak, Pangherango, Tankuwang prahu, etc., *Blume;* on the Megamendong, *Kurz* in the Munich Herb.; at Tjanjor, *Junghuhn.*

It produces a good slender, elastic and tough Rotang, much employed for ligatures and when reduced into fine strips for basket-making and other wicker work.

OBSERVATIONS.—I have seen portions of the authentic specimens of *C. anceps* Blume, of *C. calolepis* Miquel and of *C. melanoloma* Martius, and I am therefore sure that these three names have been applied to only one species. In the St. Petersburg Herbarium I have seen some very complete specimens forwarded by Teysmann, and from these I have chiefly derived the description.

C. calolepis Miq. certainly in no way differs from *C. melanoloma* Mart. The fruit of Junghuhn's specimens, which Miquel described, was very young and exactly corresponds to that of the same period of development of *C. melanoloma.* Miquel assigns to the leaves the length of 10–11 feet, evidently meaning inches.

The name *C. anceps*, employed by Blume in a manuscript paper, was published after that of *C. melanoloma*, which therefore has the precedence.

A cultivated male specimen forwarded to me from Buitenzorg is more robust than the wild ones seen by me in herbaria; it has a sheathed stem 14 mm. in diam.; the sheaths are armed with more robust spines; the petiole is very short, almost smooth; the pinniferous part is 80 cm. long with about 10 leaflets on each side, o which some are as much as 30 cm. long and 3 cm. broad; the cirrus is 50–60 cm. long.

According to Blume some of the leaves (seemingly those of the lower part of the plant) are not cirriferous and terminate in two confluent leaflets.

C. melanoloma is a very well-marked species which keeps a green colour in herbaria. It is chiefly distinguishable by its very similar male and female spadices; the slender stem; the sheaths armed with scattered spines, otherwise smooth and like the spathes and spathels not scabrid; the rather small leaves with not numerous lanceolate or oblanceolate 3–5-costulate inequidistant not fascicled leaflets; the costae naked on both surfaces; the fruit elongate-ellipsoid, beaked; the scales with an almost black margin and tip.

PLATE 214.—Calamus melanoloma *Mart.* Portion of the sheathed stem with an entire spadix, this bearing mature fruit; the summit of a plant with a male spadix in flower; the summit of a cirriferous leaf; dorsal and ventral view of the seed; one seed in two halves longitudinally cut through the embryo.—From Teysmann's specimen in St. Petersb. Herb.

185. CALAMUS SIPHONOSPATHUS Mart. Hist. Nat. Palm. iii, 342; Walp. Ann. iii, 491 and v, 832; Miquel. Fl. Ind. Bat. iii, 137; Becc. in Rec. Bot. Surv. Ind. ii, 213 and in Webbia, 70.

Calamus sp. Vidal. Rev. Pl. Vasc. Filip. 330 (No. 931 and 1942).

DESCRIPTION.—Scandent, slender or of moderate size, more or less covered in the younger parts with a rubiginous removable scurf. *Sheathed stem* 1–4 cm. in diam. *Leaf-sheaths* gibbous above, armed with very thinly laminar confluent and seriate or even scattered, opaque, schistaceous-brown or light coloured, 1–3 cm. long spines. *Ocrea* extraordinarily large, rigid and thickly papyraceous, even 20 cm. long and half sheathing the younger part of the terminal shoot, densely armed like the sheaths. *Leaves* rather large and elongate, 1–1·5 m. long in the pinniferous part and terminated with a long and rather robust cirrus; petiole more or less elongate, usually prickly all round, but chiefly in the upper surface and at the margins, biconvex, except at the base, where flattish above; rachis more or less prickly in the upper surface, where bifaced (obsoletely at first and acutely towards the summit); in the lower surface armed at first along the middle with small, remote solitary black-tipped claws, which higher up are ternate and then digitate and very sharp, in number 5–7 on the cirrus; the half or three-fourth whorls formed by these large claws often alternating with smaller whorls of more delicate ones; leaflets very numerous, subequidistant, very closely set, 15–20 mm. apart or sometimes with longer spaces interposed, papyraceous, rather firm, green and subconcolorous on both surfaces, linear or linear-lanceolate slightly attenuate towards and suddenly plicate at the base, very gradually acuminate into a long subulate filiferous tip; almost all of the same size the larger ones 25–35 cm. long, 10–15 mm. broad, the upper ones shorter; 3 or sub 5-costulate, the mid-costa acute and the side costulae slender, usually all or sometimes 3 only furnished on the upper surface with fulvous more or less rigid or subspinescent bristles; beneath the mid-costa alone bristly spinous; transverse veinlets rather prominent, not very approximate; short or much interrupted; margins rather closely spinulous-serrate. *Male spadix* supradecompound, elongate (60–85 cm. long), very strict, noncirriferous at its summit but gradually narrowing into a subulate tail-like sheathed unarmed appendix; its axis almost totally sheathed by the gradually diminishing spathes, with 6–7 also gradually diminishing partial inflorescences; primary spathes pergamentaceous or very thinly coriaceous, ultimately glabrous, finely longitudinally striate, broadly tubular and very loosely sheathing, or subinflate in their upper part, the summit of one almost reaching the base of that immediately above, rather suddenly and shortly narrowing towards the base, slightly keeled on the back, where more or less finely prickly or even smooth, prolonged at the summit into a broadly triangular acute joint; partial inflorescences shortly and rather densely panicled, attached far inside their respective spathes with a rather long peduncular part, the lower ones about 12 cm. long with 4–5 branchlets on each side (the lower ones of these branched again) and with a few simple gradually shorter spikelets at its summit; the succeeding inflorescences gradually smaller; the branchlets inserted above the mouth of their own spathe; secondary spathes infundibuliform, loose, unarmed, thin in texture, more or less obliquely truncate at the mouth, prolonged at one side into a triangular acute or acuminate point; spikelets very slender, their axis filiform, the lower ones, the largest, 10–15 mm. long, inserted far above the mouth of their own spathe with 5–6 flatly bifarious, rather loose flowers on each side; spathels narrowly tubular at the base, suddenly expanded into a bracteiform scarious ciliate, and at one side acute limb; involucre sessile, laterally attached outside its own spathel at the base of the one above, apparently formed by two very small scarious and basally connate bracteoles. *Male flowers* totally exsert from their involucres, oblong, often somewhat asymmetric and obsoletely angular, about 4 mm. long; the calyx shortly campanulate deeply striately veined, divided about midway down into 3 broad triangular acute lobes; corolla (when fully developed) almost 3 times as long as the calyx, parted down almost to the base into 3 lanceolate, narrowly oblong, acute, finely striate segments. *Female spadix* similar to the male, also ultra-decompound 0·50–1·00 m. long, with 6–8 approximate, gradually diminishing partial inflorescences and terminating in a sheathed smooth or aculeolate tail-like appendix; lowest primary spathe with a flattened smooth base and not bearing an inflorescence; upper primary spathes like those of the male spadix, but often more inflate and subauriculiform and shortly cleft on the ventral side, the summit of one covering the base of that immediately above, terminating in a broadly triangular acute or rather obtuse point, sometimes rather densely armed on the back with very short prickles or almost smooth, or the lower spathes prickly and the upper ones smooth or even all smooth; partial inflorescences panicled, broadly ovate, dense; the lower ones, the largest, 10–15 cm. long, inserted by means of an elongate pedicelliform part almost to the bottom of their respective spathe, branched at the base and with simple approximate spikelets upwards; secondary and ternary spathes very small, closely sheathing, tubular-cylindraceous, truncate, slightly apiculate at one side, finely striately veined; spikelets small, 2–3 cm. long with 6–10 flatly bifarious flowers on each side, spreading, attached above the mouth of their own spathe with a distinct axillary callus, their axis slender, slightly sinuous; spathels tubular and cylindraceous at the base, suddenly expanded in their upper part, finely striately veined, horizontally truncate, extended at one side into a broadly triangular acute point; involucrophorum laterally attached outside its own spathel at the base of the one above, sessile, explanate, scale-like, inconspicuous; involucre also scale-like, irregular, with a flat broad circular area for the insertion of the flower; areola of the neuter flower depressed, inconspicuous. *Female flowers* small, 2·5 mm. long, short and broad, ovoid or subclavate, almost horizontally inserted; calyx campanulate, the base flat, striately veined, divided midway down into 3 triangular acute teeth; the segments of the corolla narrower but as long as the teeth of the calyx. *Fruiting perianth* distinctly pedicelliform. *Fruit* very small, broadly ovoid or subobovoid, very shortly apiculate, 8 mm. long (including the perianth), 5 mm. broad; scales in 12–18 longitudinal series, straw or light-grey coloured with a paler rather coarsely toothed margin, shining, not channelled along the middle. *Seed* very small, globular, 3 mm. in diam., coarsely and deeply pitted in the centre of the raphal side; albumen equable (not taking into account the superficial intrusion of the integument); embryo basal.

Habitat.—The Philippines, where apparently a common plant in Luzon.

Observations.—The description above is a comprehensive one, *C. siphonospathus* being a very variable plant; it is, however, easily distinguishable by its spadices sheathed by gradually diminishing subimbricate loosely tubular subinflated spathes and by their dense and short supradecompound female inflorescences and by the very small fruit. It approaches very closely only *C. dimorphocanthus* and *C. microcarpus.* Martius assigned the name of *C. siphonospathus* to a specimen of a male spadix only, collected by Perrottet at Manilla in 1819 and preserved in Delessert's Herbarium at Geneva. This spadix alone, however, would be insufficient for recognizing and fixing the type of the species, but as it has been collected in the neighbourhood of Manilla and it has prickly spathes, we may consider as typical of those specimens that have this peculiarity and come from the provinces nearer the capital. Inside the spathes of Perrottet's male spadix I have found the remains of a few ants and therefore the inflated spathes are probably to a certain extent and occasionally biologically connected with these insects.

Calamus siphonospathus Mart. (Forma typica).

Description.—*Leaf-sheaths* more or less densely spinous. Leaves with the petiole and first portion of the rachis prickly on both surfaces; leaflets narrow with 3 bristly costulae above; primary spathes prickly; partial inflorescences dense and much branched; fruit scales in 15 longitudinal series.

Habitat.—Manila (*Perrottet* in Herb. Deless.); Bosoboso, prov. of Rizal (Merrill No. 1891 in Herb. Manill.); Central Luzon (*Loher* No. 1364 in Herb. Kew).

Antipolo, prov. of Rizal (*Merrill* Nos. 1641 and 1643 in Herb. Manill.) Some specimens of an adult but not yet flowering plant collected by *R. Garcia* at Azayat in prov. Pampanga (No. 53 Herb. Manill.) and another specimen of a young plant collected by *Van Wickle* at Guinayangan, prov. Tayabas (No. 31 Herb. Manill.) with a sheathed stem not more than 10 mm. in diam. apparently belong to the typical form. To a diminutive form of *C. siphonospathus* (type) apparently also belongs a specimen collected by *R. Garcia* at Arayat, prov. Pampanga (No. 60 in Herb. Manill.) with a sheathed stem only 8–9 mm. in diam. and leaf-sheaths almost totally unarmed. To No. 58 R. Garcia assigns the vernacular name of "Palimanoc" in dialect Pampanga, and to No. 60 that of "Maay" in Tagala. Van Wickle gives the name of "Talola" in Tagala to his No. 31, and says that it is employed in making furniture.

OBSERVATIONS.—Loher's No. 1364 and Merrill's Nos. 1641, 1643, 1891 are very similar and have equidistant very narrow leaflets, 10–12 mm. broad with the bristles short or subspinous on 3 costae above and on the mid-costa beneath; the primary spathes are all rather densely prickly. The fruit is broadly ovoid, shortly conically beaked with the scales in 15 longitudinal series. In a dry condition the leaflets in Merrill's specimens are subglaucescent above or contrary to the rule paler above than beneath.

CALAMUS SIPHONOSPATHUS var. FARINOSUS Becc.

DESCRIPTION.—Apparently more robust than the type. *Leaf-rachis* densely covered, at least in youth, with a dense white mealy removable tomentum and armed in its upper part with half-whorls of very robust digitate-quinate claws; leaflets equidistant and approximate (in the portion seen by me), broadly linear, with remote, long, fulvous bristles on 3 costae above, and with the bristles shorter and more numerous on the mid-costa beneath. *Female spadix* very rigid, up to 1 m. long, with comparatively large partial inflorescences; primary spathes unarmed and covered with the same mealy white removable indumentum as on the leaf-rachis; later probably glabrous. *Fruit scales* in 15 longitudinal series.

HABITAT.—Philippines at Simutan in Central Luzon (Loher No. 1375 in Herb. Kew).

OBSERVATIONS.—While the type specimens are more or less rusty-furfuraceous in the younger parts, in this variety the indumentum is very conspicuously white and very abundant, but apparently disappearing with age especially from the spathes.

CALAMUS SIPHONOSPATHUS var. SUBLEVIS Becc. in Webbia, p. 352.

DESCRIPTION.—*Leaf-sheaths* very slightly spinous or totally smooth. *Leaves* with the petiole and first portion of the rachis smooth or very sparingly prickly on both surfaces; leaflets very narrow with 3 costae smooth or very sparingly spinulous above; spathes quite smooth. *Fruit scales* in 15 longitudinal series.

HABITAT.—Mount Mariveles near Manilla.

OBSERVATIONS.—The most typical specimens of this variety are some with male spadices collected by Merrill on Mt. Mariveles (2nd January 1904, Herb. Manill.).

The plant is said to be 3–4 m. high; sheathed stem 2 cm. in diam., leaf-sheaths unarmed. with only a few flabby laminar spines round the mouth; leaves with a short smooth and only at the margins slightly prickly petiole; leaflets linear, very narrow, with 3 smooth costae above; male spadix 60 cm. long, nodding, with totally unarmed spathes; of these the two lowest not carrying partial inflorescences; these are seven. The flowers are said to be fragrant.

Other specimens, also from Mt. Mariveles, Lamao River (Nos. 308, 286, 1577 Herb. Manill.) as to the vegetative organs much resemble the male plant described above, but the sheathed stem is 13–18 cm. in diam. and more or less armed with few flabby elastic scattered spines; the ocrea (up to 10 cm. long) is also similarly armed; female spadix nodding, 60 cm. long with 6 partial inflorescences and quite unarmed spathes. The leaves have the petiole and first portion of the rachis slightly spinous or unarmed; the leaflets are very narrow, with 3 costae smooth or very sparingly spinulous above; fruiting perianth cylindricous, distinctly pedicelliform; fruit scales in 15 longitudinal series.

CALAMUS SIPHONOSPATHUS var. OLIGOLEPIS (MAJOR) Becc. in Webbia, 73.

C. inflatus Warb. in Herb. Berol.; Becc. in Perkins, Fragm. Fl. Philipp. i, 45.

DESCRIPTION.—Scandent, of moderate size. *Leaf-sheaths* . . . . . *Leaves* as large as in type; rachis in its first portion rounded and unarmed beneath, obsoletely angular above, where sparsely and rather closely spinulous; leaflets rather closely set, apparently subequidistant but now and then with a space between two leaflets longer than usual, linear-ensiform, very acuminate, up to 35–37 cm. long and 13–15 mm. broad, sub-5-costulate, or with the mid-costa on the upper surface acute and two secondary nerves on each side of it stronger than the others, the 5 nerves furnished with numerous long fulvous spreading and at the base bulbous bristles; the lower surface paler than the upper one with the mid-costa more or less bristly-spinulous and the side nerves naked. *Female spadix* as in the type; primary spathes rather densely spinulous in their upper part. *Spikelets* 3–4 cm. long with 10–12 flowers on each side. *Fruiting perianth* very distinctly pedicelliform, the calyx cylindraceous, polished. *Fruit* (when young) globose-ovoid, suddenly narrowed at the summit into a broad conic beak; scales in 12 series, convex, shining, not channelled along the middle, pale grey-yellowish with lighter scarious margin, the point short, spotted with reddish-brown.

HABITAT.—The Philippine Islands at Sampalor in the Prov. of Tajabas in Central Luzon (*Warburg* in Herb. Berol.).

OBSERVATIONS.—Distinguished from the type only in the more conically beaked fruit with fewer scales, these being in 12 instead of 15–18 series. The leaflets are remarkable on account of the numerous spreading long bristles which occur on the five nerves of the upper surface, they are 13–15 mm. broad. Of this variety I have seen a portion of the upper part of a leaf, an almost entire female spadix, 85 cm. in length with 6 gradually diminishing supra-decompound partial infloressences and terminating in a rather large closely sheathed unarmed caudiculum.

Some specimens collected by *Jagor* in Luzon in 1861 (Herb. Berol.) apparently belong to this variety, having the leaflets with 5 bristly costae above.

Vidal's No. 931 in Herb. Kew with male spadices also apparently belongs to this variety, the leaflets being very similar to those of the preceding.

PLATE 215.—Calamus siphonospathus *var.* oligolepis *Becc.* Lower portion of a leaf (upper surface); summit of the same leaf, male spadix. From a specimen collected in the year 1861 by Jagor in Luzon and preserved in the Berlin Herbarium.

CALAMUS SIPHONOSPATHUS var. OLIGOLEPIS (MINOR) Becc. in Webbia, p. 353.

DESCRIPTION.—*Leaf-sheaths* densely covered with very slender, acicular-subcriniform, fulvous 10–15 mm. long, horizontal, brown spines; those near the mouth up to 3 cm. long and erect. *Leaves* terminating in a slender about 1 m. long cirrus, which is rather regularly armed with half or three-fourth whorled claws; petiole (in one leaf) 40 cm. long, somewhat flattened-biconvex with obtuse angles, densely covered with unequal, short, subbulbous light-based, black-tipped horizontal spines; rachis in the upper surface sparsely aculeolate in its first portion, naked and bifaced upwards. *Leaflets* very numerous, equidistant, very closely set, linear-lanceolate, the largest, the intermediate ones, 18–19 cm. long, 1 cm. broad, distinctly 3-costulate, the mid-costa stronger than the side ones, the 3 costae bristly-spinulous on the upper surface, and underneath rather closely and finely bristly-spinulous on the mid-costa only. *Female spadix* as in the type, but the primary spathes unarmed or nearly so; partial inflorescences less branched; spikelets somewhat shorter and thicker than in the type *oligolepis*; spathels scaly-furfuraceous and subscabrid. *Fruiting perianth* very distinctly pedicelliform; the calyx cylindraceous polished. *Fruit* very small, subglobose-ovoid, suddenly narrowing into a conic beak, 6–7 mm. long, including the beak and the perianth, 4 mm. broad; scales in 12 series, convex, shining, not channelled along the middle, pale greyish, the margin lighter, scarious, erosely-toothed, their point short, spotted with reddish-brown.

HABITAT.—The Philippine Islands at Malunu in North Luzon (*Warburg* in Herb. Berol.).

OBSERVATIONS.—This is distinguished from the var. *oligolepis major* by its leaves with smaller very closely set equidistant leaflets, which have only 3 distinct spinulous costae, though sometimes with the vestiges of another (naked) nerve near the margins; by the almost unarmed primary spathes and smaller partial inflorescences. The rather remarkable differences in the leaflets may possibly arise from the different age of the plants. Even the bristles on the costae are smaller, more adpressed and less conspicuous than in var. *oligolepis major* and also the spadices and partial inflorescences are smaller and these less branched. I have seen of this variety an entire leaf with the upper part of its sheath and two spadices with nearly ripe fruit. The spines of the leaf-sheaths of this variety are more slender than in the type, being almost criniform.

PLATE 217.—Calamus siphonospathus *var.* oligolepis minor *Becc.* Lower portion of a leaf (upper surface); the summit of the same leaf (lower surface); fruit spadix. From Warburg's specimen in Herb. Berol.

CALAMUS SIPHONOSPATHUS var. POLYLEPIS Becc. in Webbia, p. 74.

DESCRIPTION.—*Leaves* with leaflets having 3 bristly costae above; primary spathes more or less prickly; partial inflorescences very densely flowered. *Fruit scales* in 18 longitudinal series.

HABITAT.—The Philippine Islands, S. Isidro, Prov. Morong (*Vidal* No. 4068 in Herb. Beccari).

OBSERVATIONS.—Vidal's specimens have equidistant very narrow leaflets 10–12 mm. broad with not very long bristles on 3 costae above and on the mid-costa beneath; the female spadix has very dense and very approximate partial inflorescences with the primary spathes very broad of which the lower ones are prickly on the back and the upper smooth. The fruit is subovoid, very shortly mammillate, with scales in 18 longitudinal series.

PLATE 216.—Calamus siphonospathus *var.* polylepis *Becc.* Portion of a leaf and female spadix with young fruit from Vidal's No. 4068 in Herb. Becc.; small portion of a branchlet with male flowers (upper figure) from Vidal's No. 931 (Herb. Kew); branchlet with female flowers (lower figure) from Vidal's No. 3961 (Herb. Kew). It is not certain that Nos. 931 and 3961 belong to the variety *polylepis.*

186. CALAMUS MICROCARPUS Becc. in Rec. Bot. Surv. Ind. ii, 213, et in Webbia, 355.

DESCRIPTION.—Scandent, of moderate size. *Sheathed stem* 2–2·5 cm. in diam. *Leaf-sheaths* gibbous above, armed with very thinly laminar, straight, elongate, often confluent spines. *Ocrea* large, elongate (in one specimen 6 cm. long), very densely armed with thinly laminar, ascendent, 1–2 cm. long, subulate spines similar to those which cover the sheaths. *Leaves* rather large, 1·5 m. long in the pinniferous part (in one specimen) and terminating in a strongly clawed cirrus; petiole elongate (always?), biconvex, spinous all round, and chiefly at the margins; rachis more or less bifaced and prickly above, armed beneath along the middle with claws which are solitary at first and 5-nate-digitate towards the summit and in the cirrus; leaflets numerous, approximate in groups of 3–7, 5–15 cm. apart on each side of the rachis, equidistant and flatly set (not pointing different ways) in each group, rather firmly papyraceous, 20–30 cm. long, 12–20 mm. broad, linear-lanceolate, somewhat narrowed towards the base, gradually acuminate at the summit, green on both surfaces, 3- or sub-5-costulate, viz. with the mid-costa rather acute and one or sometimes two weaker nerves on each side of it, 3 of them or all furnished with spinules or rigid bristles above; underneath only the mid-costa sparingly bristly, and the side-nerves slender and usually naked, or very exceptionally sparingly bristly; margins finely spinulous-serrate. *Male spadix* . . . . . *Female spadix* strict, elongate, about 50 cm. long, partially supra-decompound and with 6–7 gradually diminishing partial inflorescences; primary spathes tubular very loosely sheathing, subinflated or enlarged above; the first slightly flattened, the upper ones rather approximate, suddenly narrowing towards the base; the lower ones 10–12 cm. long, sprinkled with very small prickles; the upper ones gradually smaller and often smooth, thinly coriaceous or pergamentaceous, glabrous, finely longitudinally striolate, prolonged at the summit into a short triangular acute point, shortly split on the ventral side at the summit, naked at the mouth; partial inflorescences inserted far inside the mouth of their respective spathe with a distinct elongate pedicelliform part, short, diffuse, with few (3–4) spikelets on each side, of which the lower ones occasionally branched; their axis rigid, zig-zag-sinuous; secondary spathes tubular, slightly infundibuliform not very closely sheathing in their upper part, finely longitudinally striate, horizontally truncate, entire, and scarious at the margin, very shortly apiculate at one side; spikelets spreading, attached far above the mouth of their respective spathe or about midway up the axial part between two spathes, filiform, rigid, cylindraceous, slightly zig-zag-sinuous between the flowers, 4–5 cm. long, with 10–12 horizontal flowers on each side; spathels tubular-cylindraceous at the base, suddenly expanded at the summit into a short annular truncate scarious limb; involucrophorum laterally attached outside its own spathel at the base of the one above, sessile, explanate, scale-like; involucre irregular, also scale-like with a broad, circular, flat area for the insertion of the flower; areola of the neuter flower small, depressed, callous. *Female flowers* very small (3 mm. long); calyx tubular with 3 short very broad triangular teeth; segments of the corolla ovate, somewhat longer than the calyx. *Fruiting perianth* distinctly pedicelliform, the base flat. *Fruit* very small, globose, 6–7 mm. in diam., with a very shortly conic mucro; scales comparatively large and few, in 12 series, greyish, shining, deeply channelled along the middle and distinctly gibbous near the point, this obtuse, the margin scarious, ciliolate. *Seed* very small, globular, 4 mm. in diam. coarsely and rather deeply alveolate on the surface, with a small round and deep chalazal fovea; albumen bony, equable but with superficial intrusions of the integument; embryo basal.

HABITAT.—The Philippines : Luzon in the Prov. Camarinas Sur, (*Vidal* No. 3952 in Herb. Becc. and Kew); Central Luzon, (*Loher* No. 1360 and 1368 in Herb. Kew).

OBSERVATIONS.—Allied to *C. siphonospathus* from which it differs in the less inflated spathes, distinctly grouped leaflets, in the less branched partial inflorescences, and in the fruit with very deeply channelled scales.

In the Herbarium of Berlin I have seen a specimen collected in 1841 by T. Jagor in Luzon which as to the leaves apparently belongs to *C. microcarpus*, with a male spadix, which hardly differs from that of the type-specimens of *C. siphonospathus*, in the more cylindraceous and less inflated primary spathes. From what I can judge, the male spadices of *C. siphonospathus* and *microcarpus* are barely distinguishable from each other.

Vidal's specimen No. 3952 in my Herbarium is the upper part of a leaf and of a portion of a female spadix with almost mature fruit; the leaflets have the 3 costae with long bristles above. Loher's specimens are more complete and bear mature fruit; the leaflets with the costae spinulous, or with very short bristles.

PLATE 218.—Calamus microcarpus *Becc.* Intermediate portion of a leaf (under surface); basal portion of a spadix with almost mature fruit.—From Vidal's No. 3952 in Herb. Becc.

187. CALAMUS DIMORPHACANTHUS Becc. in Rec. Bot. Surv. Ind. ii, p. 214.

DESCRIPTION.—Slender, scandent. *Sheathed stem* 1–2 cm. in diam. *Leaf-sheaths* short, gibbous above, densely covered with thinly laminar, slender, acicular, solitary or shortly seriate, straight, usually horizontal, unequal (5–20 mm. long), very light-coloured or substramineous spines. *Ocrea* very large, 6–7 cm. long, papyraceous, shining and almost of a silky hue inside, densely armed externally like the sheaths. *Leaves* rather delicate, elongate and narrow in outline, about 60 cm. long in the pinniferous part, petiole very short (4–5 cm. long), flat above, convex beneath, armed all round with very slender acicular spines; rachis sub-biconvex in the first portion, angular and bifaced upwards in the upper surface where armed as well as at the sides with straight light-coloured horizontal acicular, very unequal spines, of which some occasionally, especially near the base in the leaves of young plants, extremely slender and as much as 3 cm. in length; further the rachis is armed beneath along the middle with light, solitary at first, then ternate and in the cirrus 5-nate claws; leaflets numerous, inserted at an angle of about 45°, subequidistant with occasionally a short vacant space interposed as if a leaflet were missing, thinly papyraceous, green and subconcolorous on both surfaces, small, linear or linear-lanceolate, somewhat narrowing towards the base, subulately acuminate at the summit, with only the mid-costa distinct and bristly spinulous and the side nerves very slender and smooth above; underneath, all nerves indistinct and naked; transverse veinlets remote and very short; margins rather strongly and spreadingly spinulous; the largest leaflets, those a little above the base, 10–20 cm. long, 5–10 mm. broad; the upper ones slightly decreasing in length, but not narrower. *Male spadix* when very young) elongate, cylindricous, subulate, sheathed with approximate gradually diminishing spathes, which before the anthesis are subimbricate, the summit of one partially covering the base of that above; moreover they are adpressedly and thinly rusty-furfuraceous. *Female spadix* very similar to that of *C. siphonospathus*, elongate, slightly curved, about 50 cm. long, with 5–6 partial inflorescences; primary spathes very sparingly prickly, glabrous, papyraceous, tubular, loosely sheathing and subinflate in their upper part, prolonged at the summit into a very short and broadly triangular acute point, the lowermost cylindricous, armed with numerous scattered very small horizontal slender short spinules, the secondary very slightly spinulous, the others smooth; partial inflorescences short, broadly ovoid, rather dense, inserted inside their respective spathe with a distinct pedicellar part; the lower ones, the largest, 6–7 cm. long, with few (4–5) gradually diminishing spikelets on each side; the lower of these in the lowest partial inflorescences usually branched; secondary spathes tubular, slightly infundibuliform, loosely sheathing in their upper part, horizontally truncate and entire at the mouth and shortly apiculate at one side; spikelets inserted far above the mouth of their own spathe, the larger ones about 2 cm. long with 4–5 flowers on each side; spathels shortly cylindricous at the base suddenly expanded at the summit into a short truncate limb; involucrophorum attached outside its own spathel at the base of the one above, sessile, disciform, involucre also disciform or with a broad, circular, flat area for the insertion of the flower and a very narrow annular margin; areola of the neuter flower small depressed callous. *Female flowers* very small, 3 mm. long, ovoid; the calyx with 3 broadly triangular teeth; the corolla slightly longer than the calyx. *Fruiting perianth* pedicelliform. *Fruit* ellipsoid, shortly conically beaked, 9–10 mm. long including the perianth; 5–6 mm. broad; scales in 15 series with a very obtuse and round point, shining vernicose, very faintly channelled in their basal part, straw-yellow with a vivid red-brown intro-marginal line, margin very narrowly scarious, erosely toothed. *Seed* ovoid, apparently deeply and coarsely pitted (not seen perfectly mature).

HABITAT.—The Philippine Islands. In the prov. of Igbaras (*Vidal* No. 3956 in Herb. Becc. and Kew).—Neguliang: Mariveles (*Loher* No. 1371, male specimen in Herb. Kew). Benguet: Mansitgiaran (*Loher* No. 1370, fruit-spadix in Herb. Kew).—Monte Santo Tomas, prov. Benguet, Luzon (*Elmer* No. 6238, Herb. Manila).

OBSERVATIONS.—*C. dimorphacanthus* is closely related to *C. siphonospathus* and *C. microcarpus* and differs from both in the leaflets with the mid-costa alone bristly above and in the more ellipsoid fruit with very shining scales rounded at the apex, which are also rather conspicuously bordered with a vivid reddish-brown band.

C. dimorphacanthus was originally described by me from Vidal's sterile specimens distributed with No. 3956 and taken from very young plants; my specimen has the sheathed stem 7–8 mm. in diam. and the leaflets are 10 mm. long; in the specimen at Kew the leaflets are only 5 cm. in length. Another sterile specimen is preserved in Martius's Herbarium at Bruxelles and was collected by Haenke. The leaf-rachis of these specimens bears some very long, very slender pale spines intermingled with the shorter one. In full-grown plants the long spines are not so numerous or are wanting, as they apparently give place to more robust spines. I have chiefly described Loher's specimens in the Kew Herbarium; Elmer's ones are more robust, and in these the leaves are terminated by a robust and strongly clawed cirrus; the leaflets are very rigid, 20–23 cm. long, 9–10 mm. broad, with rather long rigid bristles on the mid-costa above, the cilia on the margins rigid, subspinescent, rather approximate and spreading; the leaf-rachis armed with robust digitate claws; the fruit 10 mm. long (not quite mature). In Loher's specimen the leaflets are 17 cm. long and 7 mm. broad at most, and the fruit also immature, 9 mm. in length.

PLATE 219.—Calamus dimorphacanthus *Becc.* The summit of a plant from Loher's No. 1371 in Herb. Kew; fruit-spadix and male spadix in flower, from Loher's No. 1370 in Herb. Kew.

188. CALAMUS CONIROSTRIS Becc. in Hook. f. Fl. Brit. Ind. vi, 461 and in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—Scandent, of moderate size, 6–7 m. high. *Sheathed stem* 2·5–3 cm. in diam. *Leaf-sheaths* (sometimes flagelliferous?) obliquely truncate at the mouth, gibbous above, very powerfully armed with very unequal, spreading or somewhat deflexed, scattered, light-coloured, polished, laminar, long acuminate spines, of which some are 2–5 cm. in length and 2–5 mm. broad at the base, and others much smaller, irregularly intermingled with the larger ones; those near the mouth much narrower and longer (up to 10–15 cm. in length) acicular, straight, erect, recalling those of *Daemonorops Hystrix*. *Leaves* large, 1·8–2·5 m. long (King's collector), terminating in a short, robust, strongly and irregularly clawed cirrus, which is furnished to its extreme summit with diminutive leaflets; petiole rather long, rounded and naked beneath, channelled above, armed at the sides with short straight and often divergent spines; rachis in its first portion somewhat flattened, slightly convex and clawed at the sides beneath, channelled at the sides above where are inserted the leaflets, in its upper part acutely bifaced and smooth above and irregularly armed beneath with scattered or more or less aggregate and towards the summit ternate black-tipped claws; leaflets numerous, equidistant, about 3 cm. apart on each side, linear-ensiform, somewhat narrowed towards the base, very gradually acuminate at the summit into a long caudate bristly apex, thinly papyraceous, green on both surfaces, slightly paler beneath, with 3 costae which are very distinct, acute and bristly in the upper surface, and indistinct underneath where only that of the centre is bristly towards the summit; transverse veinlets indistinct; margins remotely, very finely and adpressedly spinulous; the lower margin in the upper surface often bordered with a very narrow shining band; the largest leaflets, those a little above the base, 45 cm. long. 25–28 mm. broad; the upper ones gradually smaller and more distant; those of the cirrus abortive, 2–3 cm. long and a few mm. broad. *Spadices* of both sexes very similar in size, number and form of the spathes; with a short robust flattened acutely two-edged and strongly prickly peduncular part bearing very few approximate partial inflorescences and terminating in a long slender sparsely and irregularly clawed flagellum, which in its lower part is rather loosely sheathed by 2–3 strongly prickly spathes; primary spathes coriaceous, tubular and closely sheathing at the base, open on the ventral side and slightly ventricose, with a narrowly elongate subauriculiform limb upwards; this strongly armed with scattered, slender, straight-spreading, acicular spines; the lowest or first spathe larger than the upper ones, flattened, acutely two-edged and unarmed at the base, the edges gradually transformed upwards into two acute keels on the back of the blade; partial inflorescences very few, often only one, especially in the female spadix, and 2–3 at most in the male spadix, erect, densely panicled-thyrsoid, somewhat unilateral, often with the lower spikelets branched in the male spadix, always simple in the female one; the lowest inflorescence, the largest, 15–18 cm. long with many very approximate gradually decreasing spikelets on each side and finally with solitary bifarious flowers at its summit; the upper ones smaller; secondary spathes short, angular by mutual pressure, infundibuliform, truncate at the mouth, prolonged at one side into a triangular very acute or acuminate point. *Male spikelets* ascendent, scorpioid; the largest, the lower ones (when simple) 20–25 mm. long with 2 slightly convergent series of 14—15 flowers each; spathels bracteiform, very approximate, very broad, concave, striately veined, ciliate, the point triangular, acute, longer than the involucre, this irregularly cupular, rather deep, usually transversely elongate or almost boat-shaped and acute at both sides. *Male flowers* very crowded, with the base immersed in the involucre and subtended by the point of its spathe, 5–6 mm. long, ovoid, obsoletely trigonous; the calyx campanulate, finely striately veined, divided midway down into 3 broad rather obtuse triangular lobes; the corolla polished outside, a third longer than the calyx. *Female spikelets* ascendent, scorpioid, short and thick, inserted just at the mouth of their own spathe; the lower ones, the largest, 20–25 mm. long with two convergent series of 8–10 flowers each, and further with 2 other distinct series of neuter flowers, these slightly smaller than the fertile ones; upper spikelets speedily decreasing in length and number of flowers; spathels very approximate, bracteiform, concave; involucrophorum cupular, half exsert from its own spathel; involucre large, deeply cupular with somewhat irregular margin; areola of the neuter flower lunate, often irregularly, sharply bordered. *Female flowers* comparatively large, about 7 mm. long. *Fruiting perianth* campanulate; the calyx smooth at the base, divided midway down into 3 broad triangular strongly striately veined acute lobes; these often with a black shining margin; the corolla also divided midway down into three acute lobes which are narrower than but as long as the lobes of the calyx; stamens forming by their united bases a cupular urceolum, this reaching about to the middle of the corolla and crowned by 6 very short teeth. *Fruit* rather large, quite smooth, about 3 cm. long, 15 mm. broad, narrowly ovoid, somewhat tapering towards the base and gradually attenuated at the summit into a large conic beak, this crowned by the rather large recurved stigmas; scales in 15 series, slightly convex, not channelled along the middle, almost black, yellow in the basal covered part, shining, the point rounded and, like the margin, coarsely erosely toothed. *Seed* ovoid, rather acute at the summit, finely tubercled all round, 14 mm. long, 10 mm. broad; albumen very deeply ruminated; embryo situated a little above the base.

HABITAT.—The Malayan Peninsula; in the district of Perak at Goping, at an elevation of 100–300 metre., collected by *Scortechini*; and in the same district, by *King's collector* (Nos. 5808 and 4593 in Herb. Calc.).

OBSERVATIONS.—Among the specimens of this *Calamus* in the Calcutta Herbarium is a strong aculeate flagellum 2·5 m. long, which apparently belongs to it. One of Scortechini's specimens has the female spadix with one and another with 2 inflorescences. In a male spadix the inflorescences are 3. The leaf-sheaths of these specimens are less spinous than in those of the Calcutta Herbarium. *C. conirostris* is allied to *C. Lobbianus*, but easily distinguishable by its climbing habit and the leaflets not being chalky-white underneath. From *C. brachystachys* this differs in the more elongate spadix terminated by a long flagelliform appendix.

The fruit of *C. conirostris* is of an uniform black colour with the scales not very easily distinguishable one from the other and forming a polished and almost even surface, because of their convex and not channelled dorsum; the orthostichies are 15, but their disposition in 8–9 oblique spiral series is more apparent.

PLATE 220.—Calamus conirostris *Becc.* The summit of a plant with an entire male spadix; portion of the sheathed stem with a fruit-spadix; basal portion of a leaf seen from the lower surface; mature fruit; seed entire and longitudinally cut through the embryo.—From Scortechini's specimens in Herb. Becc.

189. **CALAMUS LOBBIANUS** Becc. in Hook. fil. Fl. Brit. Ind. vi, 462, and in Rec. Bot. Surv. Ind. ii, 215.

C. melanocarpus Ridley in Trans. Linn. Soc. ser. II, iii, (1893) 392.

DESCRIPTION.—Standing, 2–2·5 metres high from the ground to the top of the eaves with a short stem about 40 cm. high, 14–18 cm. in diam. *Leaf-sheaths* short, open on the ventral side, very densely armed with long and short, flattened, laminar, light-coloured spines. *Leaves* 1·8–2 m. long, *non-cirriferous*; petiole very long, flattish and smooth above, rounded beneath, where smooth along the middle, armed at the margins with very unequal, short and long spines; these last remote, horizontal, acicular, up to 3 cm. long; rachis in its upper part acutely bifaced above and armed beneath along the middle with small solitary and distant claws; leaflets numerous, equidistant, 3–5 cm. apart on each side, papyraceous, very conspicuously discolorous, green and opaque above, and clothed beneath with a adpressed white substance (as if they were thinly coated with lime), ensiform or lanceolate-ensiform, from below the middle attenuated towards the base, acuminate upwards to a filiform, 3–4 cm. long, bristly tip, not very distinctly 3-costulate, the mid-costa prominent and strong, the side-costae a good deal more slender and barely distinguishable from other secondary nerves: all naked above; beneath all nerves less distinct than above, and only the mid-costa sometimes bristly near the summit; transverse veinlets slender and indistinct beneath, being covered there by the chalky indumentum mentioned above; margins smooth, the lower one somewhat thickened and bordered with a very narrow shining band in the upper surface; the largest leaflets seen by me (apparently the intermediate ones) 40 cm. long, and 2·5–3 cm. broad; the upper ones shorter, but not narrower, with their apical caudiculum somewhat shorter and thicker than in the lower ones, and often with a distinct indentation at its base on the lower margin; the two uppermost the smallest, obtuse, somewhat unequal and free at the base. *Male* and *female spadices* conform, rusty-furfuraceous, interfoliar, erect or arising from the crown of the leaves, with only one or two approximate and dense partial inflorescences at the summit of a long peduncular part; this flat on the inner side, and slightly convex externally, about 5 mm. broad, and gradually transformed into the largest and principal spathe; the spadix itself terminates in a caudate appendix—15–20 cm. long and formed by 1–2 abortive prickly spathes. The main spathe is persistent, rigid, thinly coriaceous, fusiform or elongate-ventricose, open on the ventral side, gradually narrowed towards the summit into a rather long rostrum, and armed on the back with acicular unequal short or long (as much as 2 cm.) spreading or deflexed, solitary or subseriate spines; in one specimen a male spadix is 40 cm. long, including the peduncular part, has two partial inflorescences, of which the upper one smaller with a spathe similar to the first; larger male partial inflorescence very dense, pyramidate, about 8–10 cm. long, with 10–12 very closely packed unilateral spikelets; secondary spathes very short and approximate, bracteiform, concave, amplectent, cottony; spikelets very short and dense, decreasing in number of flowers from the base to the summit of the inflorescence: the lower ones, the largest, with 5–6 distichous very approximate flowers on each side: the uppermost reduced to 1–2 flowers; spathels very closely packed together, broadly ovate, acute, concave, bracteiform, embracing the involucre and the flower, finely striately veined, ciliate, and more or less cottony; involucre calyciform, campanulate, finely striately veined, irregularly cleft or lobate. *Male flowers* large, about 1 cm. long, ovoid, roundish at the base, tapering upwards to a not very acute point; calyx thin in texture, finely striately veined outside, shortly 3-toothed; corolla (in full-grown buds) somewhat less than twice the length of the calyx, divided almost to the base into 3 lanceolate acute thinly coriaceous, externally striate, and, at the summit, thickened segments; stamens with the filaments shortly united by their bases, rather thick, subtrigonus, suddenly contracted into an inflected filiform apex; anthers lanceolate, acute, versatile with deeply disjoined cells; rudimentary ovary elongate, columnar, subtrigonous, formed by 3 subulate agglutinate bodies, one-third shorter than stamens. *Female spadix* usually with only one inflorescence; this somewhat smaller than in the male spadix, 6–7 cm. long, very dense, with the spikelets very short and few-flowered; spathels, involucrophorum and involucre bracteiform, very closely packed, strongly striately veined, acute. *Female flowers* comparatively large, about 1 cm. long, elongate-ovoid; the calyx divided midway down into 3 triangular acuminate striately veined lobes; the segments of the corolla also striately veined, narrower and about as long as or even slightly shorter than the lobes of the calyx; ovary with a long conic beak and crowned by large, internally lamellose, subulate, recurved stigmas. *Fruiting perianth* not pedicelliform. *Fruit* shining, black, ovoid, almost smooth, rather large, about 2 cm. long (when not quite mature), rounded at the base, gradually narrowed at the summit into a long and very stout beak; scales in 15 longitudinal series, slightly convex, not channelled along the middle, shining, black in the exposed and yellow in the basal covered parts, the point rounded and like the margins coarsely toothed. *Seed* not seen quite mature.

HABITAT.—Singapore, where discovered by *Lobb* in 1853 (Herb. Kew) and found again at Selitan and at Buket Timah by Mr. *H. N. Ridley*. In the Malayan Peninsula in the State of Selangore, 15th mile Pahang Track (No. 8776, Herb. Calc.), and on Gunong Pantei at about 300 m. above the level of the sea (*King's collector* Herb. Hort. Calc. No. 210); Pulau Tawar (*Ridley*).

OBSERVATIONS.—A very distinct species, allied only to *C. conirostris* and *C. brachystachys* and with these forming a small aberrant group which, on account of the rather large and short spathes, open on the ventral side, one might be induced, on superficial examination, to consider as a species of *Daemonorops*. The white coating on the lower surface of the leaflets, which distinguishes this *Calamus* from the other two of the group, is only present in a few Asiatic palms and especially in *C. hypoleucus* and *C. discolor*, in *Korthalsia echinometra* and to a lesser degree in *C. arborescens*. Lobb's specimen consists of a male spadix and some portion of a leaf and bears the note: "6–8 feet"; the Calcutta specimen No. 210 has a male spadix with 2 partial inflorescences, the upper one much smaller than the other, with a note of Sir George King's collector, Mr. Kunstler:—"Small palm; stem 18 inches high, 6 to 8 inches in diam.; frond from 5–6 feet long." Probably this diameter is not that of the naked stem, but of this covered by the sheaths of the leaves, which in this species probably are not tubular. Ridley's specimen from Singapore bears immature fruits which are 2 cm. long and resemble very closely those of *C. conirostris*.

PLATE 221.—Calamus Lobbianus *Becc.* Male spadix (on the left side in the upper part of the plate),—specimen from Selangore in Herb. Calc.; petiole (under surface) and summit of a leaf (upper surface); spadix with almost mature fruit.—From Ridley's specimen collected also at Selangore (Herb. Becc.).

190. CALAMUS BRACHYSTACHYS Becc. in Rec. Bot. Surv. Ind. ii, 215.

DESCRIPTION.—*Stem* . . . . . *Leaves* . . . . . *Female spadix* short, with only one very compact oblong (when in fruit) partial inflorescence, this borne by a short and robust flattened two-edged peduncular part, which broadens into a comparatively large spathe and terminates with a small tail-like appendix; this 10–15 cm. long and formed by diminutive prickly spathes; the solitary primary spathe lanceolate-auriculiform, open on the ventral side, somewhat flattened, keeled on the back, suddenly narrowed at the summit into a short point, thinly coriaceous, very tough, armed with scattered solitary short, straight, horizontal spines; the inflorescence when in fruit oblong, compact, 15 cm. long, formed by many very closely and irregularly packed spikelets; secondary spathes very shortly tubular, closely sheathing, truncate, obsoletely angular; spikelets very short, scorpioid, with very few approximate and irregularly biseriate flowers; spathels bracteiform, very short and very closely packed; involucrophorum cupular, immersed in its own spathel; involucre exactly cupular, entire; areola of the neuter flower distinct, lunate, not very sharply bordered. *Female flowers* comparatively large, almost 1 cm. long. *Fruiting perianth* campanulate, the calyx thinly coriaceous, split down past the middle or almost to the base into 3 broad, ovate, acute parts; segments of the corolla as long as the lobes of the calyx and a good deal narrower than these. *Fruit* comparatively large, 3·5 cm. long, 1·5 cm. broad, closely and irregularly packed, black and shining, elongate-ovoid, ventricose in the middle, somewhat narrowing towards the base and gradually tapering towards the summit into a very conspicuous conic beak; this crowned by the persistent recurved stigmas; scales in 15 longitudinal series, slightly convex, not channelled along the middle, totally black, shining, the tip rounded and at the margin coarsely erosely toothed. *Seed* ovoid-elliptic, subacute at both ends, finely tubercled and pitted all round, 17 mm. long, 10 mm. broad; chalazal fovea indistinct; albumen deeply and finely ruminated; embryo basal.

HABITAT.—Borneo, near Kuching in Sarawak, *Beccari* P. B. No. 1101.

OBSERVATIONS.—A very characteristic species, closely related to *C. conirostris*, from which it differs in the very short not cirriferous spadix. The specimen upon which this species is founded is only a spadix with mature fruit which was brought to me by a native, and nothing is known of the plant from which this spadix was detached. I have however collected on Mt. Mattang a leaf of a *Calamus*, which so closely resembles those of *C. conirostris* that I have little doubt of its belonging to *C. brachystachys*. This leaf is about 3 metres long, with diminutive leaflets in its subcirriferous termination as in *C. conirostris*; the sheath is gibbous above, almost woody, light-coloured, armed on the surface with straight spines and at the mouth with numerous erect, very straight, very long (as much as 20 cm.) rigid narrowly subulate spines; a rudimentary flagellum attached near the mouth of the sheath is filiform about as long as the spines, slightly spinulous at the summit; petiole 40 cm. long, slightly channelled above, rounded beneath, where armed along the middle with rather robust, short, straight prickles, the margins armed with short straight and often divergent spines; the rachis in its upper part is acutely bifaced above, and powerfully clawed beneath; leaflets numerous, equidistant, about 4 cm. apart on each side, linear-ensiform, somewhat narrowed towards the base, very gradually acuminate to a long caudate bristly apex, usually with a superficial but distinct indentation on the lower margin not far from the apex—this bristly from the indentation upwards—thinly papyraceous, green on both surfaces, slightly paler beneath, with 3 very distinct costae which are smooth or very sparingly spinulous above, fainter and furnished beneath, only near the summit, with small approximate subspiny bristles; transverse veinlets approximate, very minute above, almost indistinct beneath ; margins remotely, very finely and adpressedly spinulous, the lower one slightly thickened and bordered in the upper surface with a very narrow shining band ; the largest leaflets, those a little above the base, 45 cm. long, 2·5 cm. broad : the upper ones gradually smaller and more distant : those of the cirrus abortive, very narrow.

PLATE 222.—Calamus brachystachys *Becc.* The entire fruit spadix; the basal portion of a leaf with a portion of the sheath ; the subcirriferous summit of the same leaf; seed entire and longitudinally cut through the embryo.

191. CALAMUS HENRYANUS Becc. in Rec. Bot. Surv. Ind. ii, 199

DESCRIPTION.—Scandent. *Stem* slender, about 10 m. long (A. Henry). *Leaf-sheaths* not seen. *Leaves* (not seen entire) with the rachis (in a portion probably from near the base) rounded beneath, where it is armed along the middle with short, black, solitary claws and laterally with some short, straight, horizontal spines, channelled above in the centre, and with another narrow channel on each side for the insertion of the leaflets; these 32–37 cm. long, 14–16 mm. broad, inequidistant, pale green when dry, sub-concolorous and finely striately veined longitudinally on both surfaces, linear-ensiform, narrowing towards an acute base and gradually acuminate into a very slender, slightly bristly-spinulous point, furnished above with 5 finely spinulous nerves, of which the mesial is more prominent and more remotely spinulous than the others and the one near each margin fainter than the intermediate ones; in the lower surface the five nerves are finer than above and of these two more finely and less distinctly spinulous than the others; margins very adpressedly spinulous. *Male spadix* not seen. *Female spadix* not seen entire ; partial inflorescences 35 cm. long, very strictly paniculate, bearing various erect spikelets; these decreasing in length from the base upwards, irregularly and not distichously adpressed to the axis, which terminates with a spike longer than the side ones and about one-third the length of the entire inflorescence; primary spathes . . . . . ; secondary spathes membranous, smooth, tubular, slightly enlarged above and extended at one side into a broad triangular finely striately veined tip; spikelets furnished with a peduncular portion included in their respective spathes : the lower ones, the largest, 8–9 cm. long with very many distichous flowers: the upper ones gradually shorter: the uppermost with only 2–3 flowers on each side; spathels spathaceous-auriculiform; involucrophorum inserted at the bottom of its own spathe at the base of the one above (not laterally adnate to the axis), also spathaceous-auriculiform, 2-keeled on the side next to the axis; involucre moulded on the involucrophorum with the areola of the sterile flower elongate and bearing a persistent callous peduncular support to the flower about 1 mm. in length. *Female flowers* erect in the involucres and half enveloped by these, 4 mm. long. *Fruit* obovate, suddenly and distinctly beaked, small (12 mm. long when not quite ripe). *Fruiting perianth* not pedicelliform, cleft into 6 lanceolate almost equal lobes; staminodes forming a ring more or less split and crowned by 6 short triangular teeth; scales yellowish-brown with a broad intramarginal chestnut-brown line, faintly channelled along the middle; margins very narrowly scarious and erosulate. *Seed* not seen mature, but with equable albumen.

HABITAT.—China; Yunnan on the Szemao Mts at about 1700 m. (*Henry* No. 12239 in Herb. Calc.).

OBSERVATIONS.—I have seen only a small portion of a leaf and of a fruiting spadix of this which, however, seems a species very distinct by its partial inflorescences with spikelets adpressed to the axis of the spadix, decreasing in length from the base upwards and not alternately distichous as is usually the case in almost all other *Calami*. The flowers erect in the involucre and adpressed to the axis of the spikelets are of very rare occurrence. The neuter flower in the female spadix furnished with a very distinct and persistent pedicel on the areola of the involucre is also characteristic. *C. Henryanus* shows a certain affinity with *C. leptospadix*.

PLATE 223.—Calamus Henryanus *Becc.* Two partial inflorescences and portion of the leaf. From the authentic specimen in the Calcutta Herbarium described above.

192. CALAMUS THYSANOLEPIS Hance in Journ. Bot. xii, (1874) 265; Becc. in Rec. Bot. Surv. Ind. ii, 216.

DESCRIPTION.—Stemless, erect. *Leaf-sheaths* apparently not tubular and gradually passing into the petiole. *Leaves* non-cirriferous, ·8–1·2 m. long; petiole elongate, subterete, complanate; rachis in its intermediate portion trigonous, acutely bifaced above, roundish beneath, where armed along the middle with rather strong solitary claws; leaflets numerous, conspicuously clustered, 2 to 6 on each side being very approximate and almost in contact with one another and pointing different ways; the fascicles are usually opposite with long vacant spaces (5–10 cm. long.) interposed, yellowish-green on both surfaces, ensiform-acuminate with the mid-costa acute and one nerve stronger than the others on each side of it, all spinulous on the upper surface; margins spinulous; the largest leaflets 37 cm. (15 in., Hance) long, those of an intermediate portion seen by me 30 cm. long, 15 to 20 mm. broad; the upper ones gradually smaller. *Male spadix* . . . . . *Female spadix* not flagelliferous, unarmed, simply decompound with about 6 recurved partial inflorescences; primary spathes unarmed, loosely sheathing, furfuraceous, easily reduced into filaments; spikelets dense-flowered, about 7·5 cm. (3 in., Hance) long; spathels shortly tubular-infundibuliform, prolonged at one side into a triangular acute point. *Fruiting perianth* distinctly pedicelliform. *Fruit* broadly ovoid-ellipsoid, shortly conically beaked, 15 mm. long; scales in 18 series, not channelled along the middle, reddish-yellow passing into reddish-brown towards tho apex, the margins finely ciliate-fringed. *Seed* ellipsoid, slightly flattened, subtubercled on the back, with a deep chalazal fovea on the raphal side; albumen equable; embryo basal.

HABITAT.—South China; in the Island of Hong-Kong near the sources of the River Taitamtuk discovered in 1873 by Dr. *G. Dods.* (Herb. Hance. No. 18373).

OBSERVATIONS.—I have seen of this only a very fragmentary specimen in the St. Petersburg Herbarium, and I have chiefly derived my description from Hance.

It seems to belong to the group V, B, but in this is distinct from any other by its erect habit, with loosely sheathing, fibrous, dilacerate spathes and the leaves with very conspicuously clustered, ensiform leaflets: these very approximate in each fascicle and pointing different ways.

PLATE 224.—Calamus thysanolepis *Hance.* An intermediate portion of the leaf with four fascicles of leaflets (upper surface); another small portion of the same leaf (lower surface); portion of a spikelet with mature fruit (nat. size); fruit magnified. From Hance's No. 10373 in St. Petersburg Herb.

193. **CALAMUS FERRUGINEUS** Becc. in Rec. Bot. Surv. Ind. ii, 216 (excl. descript. of leaves).

DESCRIPTION.—Scandent. *Sheathed stem* 12 mm. in diam. *Leaf-sheaths* gibbous, plicate above, rather strongly striate-costulate longitudinally, armed with a few scattered or seriate, but individually distinct, flat, horizontal, 10–12 mm. long spines and clothed while young, as almost any other part of the plant, with a rusty furfuraceous, more or less sooner deciduous, scurf composed of small chaffy hairs which rest on very minute tubercles, these rendering very finely scabrid not only the sheaths but also the petiole, rachis, axial parts, spathes and to a certain extent even the spines. *Leaves* about 1 m. long in the pinniferous part (in one specimen) and terminating with a slender, 50 cm. long, cirrus; the petiole very short (6 cm. long) plano-convex with not very acute margins, these sparingly armed only with a few strong, long, deflexed prickles; above the rachis is flattish at the base, with two narrow side faces where are inserted the lowest leaflets, then bifaced with the salient angle at first obtuse but speedily acute; underneath at first convex, then flattish, armed in its basal part along the centre of the dorsum with a few but strong solitary straight deflexed 10–12 mm. long prickles which higher up become shorter, claw-like towards the summit and ternate only in the cirrus, always remaining with a slender very acuminate and very slightly curved point; leaflets rather few (30 on the whole in one specimen) opposite, the pairs equidistant, 6 cm. apart, all strongly deflexed, attached to the rachis by means of a slightly callous base; the callosity remaining above in the place where normally is the axil and by its position obliging the leaflet to bend downwards; beneath, just in the point where each leaflet springs from the rachis, is a small spine, which points in a contrary way to the prickles of the rachis; the leaflets are rather firmly papyraceous, green on both surfaces, narrowly lanceolate, all about of one size, 22–25 cm. long, 20–25 mm. broad, broadest about the middle and thence almost equally narrowing towards both ends, but rather suddenly narrowing at the summit into a 15–20 mm. long and at the sides bristly tip, not very distinctly plicate-3-costulate above and here with the mid-costa alone sparingly spinulous towards the summit, underneath quite smooth; transverse veinlets not very conspicuous; margins with not numerous, spreading spinuliform bristles. *Female spadix* densely covered with a removable rusty furfuraceous indumentum and minutely scabrid, rather short (45–75 cm. long), rigid, slender, not flagelliform, with few partial inflorescences and terminating in a small (5–7 cm. long) aculeolate tail-like appendix; peduncular part of the spadix not very long, flattened, acutely two-edged, unarmed or nearly so; primary spathes tubular, somewhat enlarged above, slightly flattened, keeled on the back, the keel armed with small hooked prickles, otherwise unarmed, obliquely truncate, entire and densely ciliate-bearded at the mouth, prolonged at one side into a triangular acuminate erect point; partial inflorescences inserted at the mouth of their own spathe, strongly arched downwards: the lower ones, the largest, about 20 cm. long with 8–10 alternate subunilateral spikelets: the upper ones gradually smaller; secondary spathes tubular, slightly infundibuliform, more or less angular by mutual pressure, tomentose, ciliate-barbate at the mouth and prolonged at one side into a short point; spikelets subscorpioid, arched, inserted just at the mouth of their own spathe, assurgent or pointing upwards: the lower ones, the largest, 3–4 cm. long: the upper ones gradually shorter, with two series of slightly assurgent female flowers (each series of ten) and two distinct smaller series of neuter ones; spathels short, bracteiform, concave, very broad, acute, strongly deflexed, ciliate, scaly-scurfy; involucrophorum explanate, bracteiform, laterally adnate outside its own spathel at the base of the one above; involucre explanate, calyculiform, irregularly and acutely 3-toothed; areola of the neuter flower very depressedly lunate. *Female flowers* with a secund arrangement (not flatly bifarious) ovoid, acute, about 3 mm. long. *Neuter flowers* similar to the male ones but slightly smaller. *Fruiting perianth* shortly but distinctly pedicelliform; the calyx indurated, slightly ventricose and smooth at the base, divided to the middle into 3 triangular acute lobes; segments of the corolla ovate, acute, about as long and as large as the lobes of the calyx and like this opaque outside and almost black when dry. *Fruit* (when very young) broadly obovoid, small (5–6 mm. in diam.), slightly tapering towards the base, suddenly narrowed at the summit into a rather stout beak; scales in 18 series not or very indistinctly channelled along the middle, subshining, reddish-brown towards the point, yellowish at the base, the point slightly prolonged, not very adpressed, scarious, erosely toothed.

HABITAT.—Borneo. Collected firstly by *Lobb*, probably in Sarawak (according to a specimen in the Calcutta Herbarium) and found again by me also in Sarawak near Kuching (*Beccari* P. B. No. 563).

OBSERVATIONS.—Lobb's specimen is of an entire leaf and of a female spadix, this 45 cm. long with 3 partial inflorescences and flowers not yet expanded. My specimen is only of an entire female spadix 75 cm. long with 7 gradually decreasing partial inflorescences and immature fruit. The conspecifity of this second specimen with the first is proved by the very peculiar rusty scurf which after its fall leaves the surface of every organ minutely scabrid; this same character has enabled me to discover the shifting of parts of *C. ferrugineus* and *Daemonorops cristatus* (two species collected by Lobb in Borneo) which had occurred in the Calcutta Herbarium, and which had led me to attribute to *C. ferrugineus* the leaves of *Daemonorops cristatus* and *vice versâ*. *C. ferrugineus* is a very easily recognizable species by its rusty and scabrid indumentum and especially by the peculiar disposition of its leaflets, which in no other species known to me are so conspicuously deflexed or turned in the same direction with the prickles of the rachis, while as a rule the prickles or claws of the rachis are pointing downwards and the leaflets upwards; very curious are also the two small spines at the base of the leaflets, decussating with the larger ones of the rachis. This species apparently stands alone amongst the cirriferous species with non-flagelliferous spadices and a pedicelliform fruiting perianth.

PLATE 225.—Calamus ferrugineus *Becc.* The lower portion (with its sheath) and an intermediate portion of a leaf; the cirrus; female spadix with not yet expanded flowers,—from Lobb's specimen in the Calcutta Herb. Female spadix with immature fruit,—from Becc. P. B. No. 563.

194. CALAMUS KUNZEANUS Becc. sp. n.

DESCRIPTION.—*Fruit* small, 1 cm. long, 8 m. broad, obovoid, round at both ends especially at the summit, where not mucronate; scales in 12 longitudinal series, very few in each series, shining, straw-coloured, relatively large, rather convex and rather loosely imbricate, slightly channelled along the middle, with a narrow dark marginal line, their point very obtuse, the margins finely erosely toothed. *Fruiting perianth* explanate; the calyx split down to the base into 3 very broad, almost orbicular, very boldly striately veined lobes; the segments of the corolla as long as the calyx, ovate and also strongly striately veined. *Seed* ellipsoid, somewhat flattened, about 7 mm. long, 5 mm. broad and 3·5 mm. thick, its surface unequal with small depressions and straight ridges (when cleaned from the crustaceous, brittle, once fleshy, integument) especially radiating from the chalazal fovea; this deep, circular, placed in the centre of the raphal side; albumen equable; embryo in the centre of the face, opposite to the chalazal fovea.—Other parts unknown.

HABITAT.—In Cambodia where collected by Dr. *Otto Kunze* in March 1875 (Herb. Berol.).

OBSERVATIONS.—I should not have named this species from the fruit only, were not this so peculiar and its characters so rarely met with in the genus *Calamus.* The fruit round at the top, not beaked, with few scales; the seed with equable albumen; the embryo in the centre of one of the faces and the explanate perianth distinguish this species from all the others where the fruit is known.

PLATE 226, IV.—Calamus Kunzeanus *Becc.* Fig. 14, mature fruit; fig. 15, fruiting perianth seen from above; fig. 16, seed, raphal view; fig. 17, the seed represented in fig. 16 as seen from the embryo side; fig. 18, seed longitudinally cut through the embryo and the chalazal fovea; the same seed as represented in fig. 18 transversely cut through the embryo and the chalazal fovea. All figures enlarged 4 diam.

195. **Calamus Lauterbachii** Becc. sp. n.

Description.—Scandent and apparently rather slender. *Leaf-sheaths* covered with a dark furfuraceous indumentum, densely armed with very small, triangular, obliquely inserted, ascendent prickles, which are about 2 mm. long, flat beneath and tumescent above at their base. *Ocrea* probably very large at its base; the portion seen by me marked by transverse interrupted spinescent ridges or crests. *Leaves* not cirriferous, short, in one specimen 40 cm. long; petiole relatively long (9 cm.), under the lens scabridulous-furfuraceous, yellowish-brown, flattish above near the base, then slightly convex and sprinkled with small spinescent tubercles: beneath also rather convex, unarmed near the base, spinous upwards like the first portion of the rachis, the margins very obtuse, not or sparingly tubercled-spinulous; rachis rather stout, acutely bifaced shortly beyond the base above, armed beneath with very small confluent (in groups of 3–5) and irregularly subverticillate broad-based and black-tipped claws; leaflets not numerous, 6 on each side, with a bilobed one at the summit, not very distinctly approximate into three groups, the pairs of one side not very approximate, opposite or nearly so to those of the other side, subpergamentaceous, rigidulous, glabrous, slightly longitudinally plicate, sub-concolorous and almost shining on both surfaces, lanceolate or oblong-lanceolate slightly concavo-convex or cochleariform, attenuate to the base and with a rather distinct axillary callus at their insertion, rather suddenly narrowed at the summit into a short and at the sides bristly-spinulous tip; the mid-costa acute and raised above, obliterated beneath, naked on both surfaces; secondary nerves 2–3 on each side of the mid-costa, very slender and indistinct on both surfaces; transverse veinlets very fine, very crowded and much continuous; margins acute (not thickened by a marginal nerve), furnished with relatively strong and short spinules: these closer, longer and more, spreading towards the summit; the largest leaflets, the intermediate ones, 18–21 cm. long and 4 cm. broad: the lower and higher ones shorter but not narrower: the two of the terminal pair connate for two-thirds of their length. *Male spadix* short, about as long as the leaves, with 4 partial inflorescences (in one incomplete specimen); primary spathes covered with a removable fuscous furfuraceous indumentum, loosely sheathing, papyraceous, exsuccous and partly decayed when the flowers are expanded: the first strongly flattened, two-edged, the edges very acute and closely serrate with ascendent spinules, prickly on the faces: the upper ones enlarged above, split on one side, narrow and tubular at the base, where armed with very small tuberculiform prickles; partial inflorescences with very approximate not distinctly bifarious spikelets, forming small compact cupressiform panicles which are 6–10 cm. long and arise erect from their respective spathe; secondary spathes bracteiform with a short basal tubular part and suddenly expanded into a spreading, broadly ovate, acute, membranous, exsuccous and ultimately marcescent limb; spikelets thick and short, 1–2 cm. long, with very closely packed and apparently pluriseriate and not bifarious flowers; spathels bracteiform with a broad concave obtuse striately veined limb and sprinkled with fuscous scales like the other appendicular organs; involucre more or less irregularly cupular, often transversely evolute and subcymbiform or subbilobed, the lobes obtuse. *Male flowers* rather large, about 5 mm. long; the calyx coarsely striately veined and scaly-furfuraceous, divided about midway down into 3 broad ovate obtuse lobes; the corolla twice as long as the calyx, faintly striately veined; stamens with very thick filaments; anthers sagittate with obtuse point and auricles; rudimentary ovary as long as the stamens, divided into 3 linear-subulate bodies. The spikelets are very compact on account of the very abbreviate secondary spikelets they bear; on this account the spadix is only apparently simply decompound.—Other parts unknown.

HABITAT.—German New Guinea: Bismark Ebene, at 100 m. elevation, (*Lauterbach* No. 2488 in Herb. Berol.)—Native name "Schüh."

OBSERVATIONS.—A species very characteristic by its short leaves with few broad 1-costate grouped leaflets, the two of the summit highly connate; by the short male spadix with dense partial inflorescences and by the not distinctly bifarious flowers on the spikelets. Perhaps the affinities of *C. Lauterbachii* are with those of the group of *C. macrochlamys*, if I may judge from the remains of an apparently large ocrea.

Of *C. Lauterbachii* I have seen only an entire leaf and a male spadix without the summit.

PLATE 227.—Calamus Lauterbachii *Becc.* An entire leaf; male spadix.—From Lauterbach's type-specimen in Herb. Berol.

196. CALAMUS FERTILIS Becc. sp. n.

DESCRIPTION.—*Female* spikelets 15–18 cm. long, rigid, vermicular, cylindraceous, slightly curved and flexuous, terminating in a slender mucro, composed of 20–24 tubular-infundibuliform almost symmetric spathels, which are horizontally truncate and decayed at the margin and covered with a removable fuscous-furfuraceous indumentum; involucrophorum short, cupular, with a short truncate limb and containing two equal collateral involucres and therefore two equal female flowers; the involucres cupular, united by their bases and each furnished on its inner side with an indistinct or not sharply defined ovate areola for the reception of a neuter flower, so that apparently two sterile flowers are in contact between the two fertile ones. *Female flowers* about 5 mm. long. *Fruiting perianth* split and explanate under the fruit and marcescent. *Fruit* ovate with a broad base, very shortly and suddenly beaked, 18 mm. long, 10–11 mm. broad; scales in 18 series, yellowish-brown; narrowly and neatly channelled along the middle with a narrow very dark intramarginal line, the margins very narrowly scarious and finely erosely toothed, the tip short obtuse very dark. *Seed* subglobular, about 1 cm. long, 8 mm. broad, 7 mm. thick, slightly flattened on the raphal side with a very slight depression in the place of the chalaza, irregularly pitted on the back; albumen bony, equable; embryo basal.—Other parts unknown.

HABITAT.—British New Guinea; on Mt. Dayman, discovered by *W. E. Armit* in 1894 and forwarded to me by the late Baron F. von Mueller.

OBSERVATIONS.—I have seen of this only 3 spikelets with a few bruised fruits and two entire mature seeds, but these parts are so unlike the corresponding ones of the generality of the species that I have ventured to establish on them a new one. Only 2 or 3 other *Calami* have constantly collateral female flowers at each spathel, but this perhaps is the only one where each of the two is accompanied by a neuter one.

It does not seem related to any of the other species with geminate female flowers, and it seems to me also to stand alone amongst the Papuan species of *Calamus* known to me, or at least amongst those where the female spadix is known.

PLATE 226, II.—Calamus fertilis *Becc.* Fig. 5, an entire spikelet with two mature fruits; fig. 6, portion of the spikelet represented in f. 5, enlarged 6 times; fig. 7, fruiting perianth seen from above, enlarged 6 times; fig. 8, seed, dorsal view; fig. 9, seed longitudinally cut through the embryo; figures 8, 9, of natural size.

197. CALAMUS MACGREGORII Becc. sp. n.

DESCRIPTION.—Scandent? *Leaf-sheaths* . . . . . *Leaves* not cirriferous, petiole . . . . , rachis in its upper portion bifaced above, flattish beneath, where irregularly and rather densely armed from the base to the very summit along the middle and at the sides up to a certain distance, with small claws; leaflets numerous, inequidistant chiefly near the summit, many of them regularly 2·5 cm. apart and the succeeding ones separated by longer intervals (3–6 cm.), thinly papyraceous, linear-ensiform, equally narrowing towards both ends, not very acuminate at the apex, concolorous and shining on both surfaces, tri-costulate; the costae slender, furnished above with a few long bristles; beneath only the mid-costa bristly; the margins remotely and adpressedly spinulous, the spinules longer and more spreading near the summit; the largest leaflets 30 cm. long and 2 cm. broad: the upper ones suddenly shorter: the two of the terminal pair free, but slightly decurrent one above the other at the base. *Female spadix* not seen entire by me, apparently simply decompound; primary spathes. . . . . ; partial inflorescences short, rigid, patent, 16–20 cm. long, terminating in a very short (1 cm. long) unarmed caudiculum, and with 8–10 spikelets on each side; secondary spathes thinly coriaceous, tubular-infundibuliform, unarmed, entire and slightly obliquely truncate at the mouth, prolonged at one side into a short triangular point; spikelets short, arched, spreading, the lower ones, the largest 3–4 cm. long at most, the upper ones shorter, attached to the bottom of their respective spathe through a strongly flattened, 6–7 mm. long, pedicel; spathels short, broadly asymmetrically infundibuliform, truncate and slightly apiculate; involucrophorum very short, dimidiately cupular; involucre cupular, truncate; areola of the neuter flower conspicuous, broadly ovate or suborbicular with sharp raised margins or sometimes concave and almost cupular. *Fruiting perianth* not pedicelliform, almost entirely split and explanate under the fruit; its calyx slightly callous and somewhat narrowed towards the base. *Fruit* ovoid, 13–15 mm. long, 1 cm. broad, almost equally narrowing towards both ends, not mucronate and slightly mammillate at the summit and terminated by the small persistent recurved stigmas; scales in 18 series, opaque, light straw-coloured, very gibbous with a rather narrow channel along the middle, the margins slightly paler and finely erosely toothed. *Seed* ovate, 8 mm. long, 6 mm. broad, rounded at both ends, with a rather deep chalazal fovea on the raphal side, coarsely alveolate on the back; albumen equable; embryo basal.

Habitat.—British New Guinea, where discovered on the Fly River in 1890 by *Sir William Macgregor.*

Observations.—I have seen of this only the upper portion of a leaf (which was 60 cm. in length) and 3 detached partial inflorescences. It is difficult to point out the affinities of this species, almost all New Guinean *Calami* being very imperfectly known. Characteristics of this species are the slightly inequidistant, elongate, 3-costulate leaflets; the short and rigid partial inflorescences with spikelets inserted through a distinct and long pedicel inside their respective spathes; and the fruit with very light-coloured, narrowly channelled and strongly gibbous scales.

In the spikelets with a pedicelliform part included in their respective spathes and in the non-cirriferous leaves this approaches the species of group II.

Plate 230.—Calamus Macgregorii *Becc.* Summit of a leaf, upper surface; portion of a leaf, under surface; 3 partial fruiting partial inflorescences; seeds, one longitudinally cut through the embryo, one from the raphal side, another from the opposite side.—From Herb. Beccari.

198. Calamus Hartmanni Becc. sp. n.

Description.—Non-scandent. *Stem* as thick as a walking cane, 2·5–3 metres high. *Leaf-sheaths* . . . . . *Leaves* non-cirriferous, in one specimen about 60 cm. long including the petiole, this 15 cm. in length, obtusely trigonous, striate, glabrous, opaque, slightly arched, very narrowly channelled along the middle on the upper surface, feebly armed beneath (and in its lower part also at the very obtuse margins) with weak, hooked prickles; rachis almost from the base bifaced with a rather acute and smooth salient angle above, roundish, unarmed and striate beneath; leaflets not very numerous, 14 on each side in one specimen, with a bilobed terminal one, inequidistant, usually approximate in couples on each side with short vacant spaces interposed, papyraceous, rather firm, glabrous and subconcolorous on both surfaces, very slightly paler beneath, narrowly oblong or oblanceolate, tapering lower down towards a rather acute base, very suddenly contracted at the summit into a short, acuminate, bristly-spinulous tip, slightly concave-convex, finely and acutely 3–5-costulate with a few secondary nerves interposed; all nerves naked on both surfaces and rather distinct also in the lower one; transverse veinlets very sharp, very approximate and continuous across the blade; margins very remotely and inconspicuously spinulous; the largest leaflets, those near the summit, 14 cm. long, 3 cm. broad, more concave-convex than the others: the terminal cuneately narrowed towards the base, formed by two connate midway up: the lower ones gradually smaller: the smallest, the lowest, 4 cm. long, 8–10 mm. broad.—Other parts unknown.

Habitat.—British New Guinea. Collected by Mr. *C. H. Hartmann* in 1887 and forwarded to me by Baron Ferdinand von Muller. Hartmann's original note says: "Walking cane. Top main R. 7–8 feet."

OBSERVATIONS.—I have seen of this only a leaf, which apparently belongs to a non-scandent plant, being very sparingly prickly on the petiole and quite smooth on the rachis; furthermore it is distinguishable by its oblong geminate suddenly apiculate leaflets, with very numerous approximate and continuous transverse veinlets, as in the species of the group of *C. heteracanthus*, and with 3–5 slender costae—naked and distinct on both surfaces—and by the terminal leaflet deeply bilobed (being formed by two highly connate leaflets) and gradually cuneate at the base. Its affinities are doubtful, but perhaps they are with the species of group XII.

PLATE 231.—Calamus Hartmanni *Becc.* The type-specimen in Herb. Beccari.

199. CALAMUS DISCOLOR Mart. Hist. Nat. Palm. iii, 212 (1st edit.) and 341; Kunth, Enum. Plant. iii, 212; Walp. Ann. iii, 491 and v, 832; Miq. Fl. Ind. Bat. iii, 136.

C. Lindenii Rodigas, Illustr. Hort. xxx (1883), 157, t. CCCCLXXXIX.

DESCRIPTION.—Non-scandent? *Leaf-sheaths* open on the ventral side, densely armed with long straight broad-based brown spines. *Leaves* non-cirriferous; leaflets numerous, equidistant, lanceolate, acuminate, narrowing towards the base, dark green above, nearly white beneath. (Descript. from Rodigas.)

HABITAT.—The Malay Archipelago.

OBSERVATIONS.—*C. Lindenii* has been described and figured from a living young plant, but it is easy to recognise in it *C. discolor* of Martius, known also from sterile specimens only. Two leaves preserved in the Herbarium at Kew and labelled: "Philippines. Ex. Herb. Veitch 1897" entirely correspond to the description of Martius and to the plate quoted above, except that the leaflets are smaller and more numerous, but perhaps this is only a difference depending on age. The two leaves are narrowly oblong-elliptic in outline, 75–80 cm. long including a petiolar portion; this about 20 cm. long, roundish and like the rachis densely rusty-furfuraceous and armed with feeble straight unequal solitary horizontal short acicular spines; in the upper surface the rachis is provided also with scattered blackish bristles; the leaflets are numerous (65 in one leaf), equidistant, rather approximate, narrowly lanceolate, almost equally narrowed towards both ends, rather shortly acuminate at the summit, all, except a few at the extremities, of about the same size, 12–13 cm. long, 12–13 mm. broad, thinly papyraceous, green and subtri-costulate above or with the mid-costa rather acute and one slender nerve on each side of it furnished with a few long blackish bristles, conspicuously covered with a very tenuous crustaceous white indumentum beneath, where the mid-costa is very minutely bristly spinulous; transverse veinlets distinct, remote, much interrupted; margins very minutely and adpressedly spinulous.

PLATE 228.—Calamus discalor *Mart.* An entire leaf.—From Veitch's specimen in Herb. Kew.

200. **CALAMUS ACIDUS** Becc.

C. barbatus (partly) Bl. Rumphia, iii, 42.

Rottang acidum seu *Rottang Assam* Rumph. Herb. Amb. v, 119, t. LVIII, fig. 2 and E.

DESCRIPTION.—Not scandent. *Stem* the height of a man. *Leaf-sheaths* densely armed with slender spines. *Female spadix* simply decompound with many partia inflorescences, which bear many spikelets; these 2–2·5 cm. long with two collateral assurgent series of 6 flowers each; involucrum distinctly cupular. *Fruit* very closely packed in the spikelets, ovate, distinctly conically beaked, 15–17 mm. long, 1 cm. broad; scales numerous. *Seed* flattened, enveloped by an acid fleshy integument and with a distinct chalazal fovea. (Descript. from that of Rumph, and from his plate.)

HABITAT.—Bouton in Celebes.

OBSERVATIONS.—Blume had reduced Rumph's "Rottang Assam" to *C. barbatus*; but it seems to me a quite distinct species because of its very short spikelets with very closely packed fruits.

201. **CALAMUS** (**ZALACCELLA** Becc. gen. nov.) **HARMANDI** Pierre mss.—Becc. in Rec. Bot. Surv. Ind. ii, 216.

DESCRIPTION.—Apparently erect or stemless or tufted, of rather small dimensions. *Leaf-sheaths* not tubular, open on the ventral side and gradually passing into the petiole, powerfully armed with confluent or shortly transversely seriate, horizontal, laminar, subulate, 2–3 cm. long spines; petiole elongate, 8 mm. broad, deeply channelled above, rounded beneath, where smooth along the middle, armed at the margins with rather strong, straight, subulate, at the base callous, 3–4 cm. long spines; rachis in its first portion armed beneath along the middle with long, solitary, remote, horizontal, straight, broad-based spines, upwards acutely bifaced above and naked beneath. *Leaves* rather large, non-cirriferous, pari-pinnate; leaflets numerous, equidistant, the lower ones closely alternate, the upper ones usually opposite and 2–2·5 cm. apart, papyraceous, linear-ensiform, slightly narrowed to and suddenly plicate at the base, where rusty-furfuraceous beneath in the plicature, gradually acuminate to a long and subulate bristly tip, light green even when dry, opaque, slightly paler and subglaucescent beneath, where the nerves are slender and quite naked, with 3 acute rather closely spinulous costae above; transverse veinlets minute, inconspicuous; margins very minutely adpressedly and remotely spinulous from the middle upwards; the largest leaflets, the lower ones, 30–40 cm. long, 10–15 mm. broad: the upper ones suddenly decreasing in length, less acuminate and some of them almost obtuse: the two of the terminal pair the smallest, very narrow, free at the base. *Male spadix* . . . . *Female spadix* apparently with a rigid, erect, slender, straight, unarmed, rusty-furfuraceous axis and with a few distant superposed inflorescences; primary spathes elongate-cylindraceous, closely sheathing, papyraceous, unarmed, prolonged at the summit into a lanceolate ultimately fibrous lacerate limb; partial inflorescences erect, sessile at or near the mouth of their own spathe, spiciform, about 10 cm. long, cylindraceous, 2·5 cm. thick when covered with almost mature fruits; the axis of the inflorescence rather thick, woolly-furfuraceous, with the appendicular organs (secondary spathes, spathels and involucres) indistinct, being small, bracteiform and hidden amongst the very crowded and closely packed fruits. *Flowers* sessile, apparently in glomerules of three of which the central one female and fertile and the side ones male (or neuter ?). *Fruiting perianth* 4 mm. long, not pedicelliform, broadly obconic; the calyx thinly coriaceous, split down almost to the base (sometimes irregularly) into 3 ovate, acute lobes ; the corolla one-third longer than the calyx, its segments ovate-lanceolate, not very acute; staminal urceolum as long as the calyx almost truncate and crowned by 6 short dentiform filaments. *Fruit* small, 1 cm. long (immature), very closely packed round the axis and apparently disposed according to 6 slightly spiral series, obovate-turbinate, narrowed towards the summit into a comparatively stout conic beak ; scales in 18 series, convex, not channelled along the middle, chestnut-brown, shining, their margins ciliate or minutely fimbriate, tip round. *Seed* (immature) pisiform ; albumen equable.

HABITAT.—Lower Cochin-China at Thulet-Thay, (*Harmand* No. 1198 in Herb. Pierre).

OBSERVATIONS.—A very remarkable palm, apparently the type of a new Genus, for which I propose the name of *Zalaccella.* It has many of the characters of a *Zalacca*, but is distinct by its leaves indistinguishable from those of a *Calamus* and with non-sigmoid leaflets and by the elongate spadix with tubular closely sheathing spathes and cylindraceous superposed inflorescences, where the flowers are so closely packed together that without an accurate examination on appropriate specimens it is difficult to recognize the relative position of the flowers and of their appendicular organs. From *Calamus* it differs also in the non-tubular secondary spathes and in the flowers arranged in 6 series on a cylindricous axis and not disposed in separate spikelets, and perhaps also by the 3-nate flowers of which only that of the centre fertile. I have seen of this palm only portion of the leaves and two partial inflorescences, apparently belonging to the same spadix, with not quite mature fruit.

PLATE 229.—Calamus (Zalaccella Becc.) Harmandi *Pierre*. Basal portion and summit of a leaf ; portion of a spadix with immature fruit.—From Harmand's No. 1198 in Herb. Becc.

Doubtful, imperfectly known or unrecognised species.

1. CALAMUS AMARUS Lour. Fl. Cochinch. i, 210 (edit. 1); Roem. et Schult. Syst. Veg. vii, 2, 1332; Mart. Hist. Nat. Palm. iii, 213 (first edit.) and 343; Kunth, Enum. Plant. iii, 213; Walp. Ann. iii, 492 and v, 832; H. Wendl. in Kerch. Les Palm., 235.

OBSERVATIONS.—It seems to me very probable that *C. amarus* Lour., from Cochin-China, is identical with *C. tenuis* Roxb. (See observations under that species.)

2. CALAMUS BUROENSIS Mart. Hist. Nat. Palm. iii, 336; Walp. Ann. iii, 486 and v, 830; Miq. Fl. Ind. Bat. iii. 121 and De Palm. Arch. Ind. 27 (*C. buruensis*); Becc. in Rec. Bot. Surv. Ind. ii, 217,

C. viminalis B. prostratus Bl. in Roem. et Schult. Syst. Veg. vii, 2, 1328; Kunth, Enum. Plant. iii. 205.

Palmijuncus viminalis ex Bouro prima species Rumph, Herb. Amb. v, 109 (excl. pl. LV, f. 2).

HABITAT.—Buru. Malay name: "Rottang Vanitette," or "R. Vantette" (Rumph).

OBSERVATIONS.—This species was based by Martius on plate LV, fig. 2, of Rumph's *Herbarium Amboinense*, and on the description of *Palmijuncus viminalis* from Buru, which at vol. v., p. 109 of that work begins with the words "Praecedentis Rottang Javae nobis alia obvenit species etc.," but the figure represents without a shade of doubt *C. viminalis* from Java, while the description corresponds to *C. viminalis B. prostratus* of Blume. Rumph's description of *Palmijuncus viminalis* from Buru, however, though insufficient for recognising a *Calamus*, is very probably that of a distinct species growing in the Island of Buru, which perhaps in future may be identified with the assistance of its native name.

3. **CALAMUS CURAG** Blanco Fl. de Filip. edit. 1, i, 268; Miq. Fl. Ind. Bat. iii, 113.

OBSERVATIONS.—It is only known that this is an erect species growing on the mountains of Angat in the Philippines, which has not been seen even by its author, Father Blanco.—Probably not a *Calamus*.

4. **CALAMUS EPETIOLARIS** Mart. Hist. Nat. Palm. iii, 336; Miq. Fl. Ind. Bat. iii, 122 and De Palmis, p. 27; Walp. Ann. iii, 486 and v, 830; H. Wendl. in Kerch. Les Palm. 236; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—Bushy, slender, scandent. *Leaf-sheaths* gibbous above, armed with a few straight broad-based scattered dark-tipped spines. *Leaf-sheath flagella* slender, clawed. *Ocrea* short, bristly-spinulous. *Leaves* not cirriferous; the petiole almost obsolete; the rachis armed with solitary or geminate brown-tipped hooked prickles. *Leaflets* rather remote, subequidistant (24–32), all in one plane, lanceolate, long-acuminate and cuspidate, almost shining beneath, with a mid-costa and 6 secondary nerves, these naked, the first bristly on both surfaces. *Spadices* unknown (Descript. from Martius).

HABITAT.—Java? Reinwardt (Martius).

OBSERVATIONS.—I have not seen the authentic specimen of this species, which probably is only the juvenile stage of another, which has been described under a different name. Martius says that it resembles *C. heteroideus* in the not numerous leaflets and *C. viminalis* in the armature, and that it differs from both in the very short petiole.

5. CALAMUS EXTENSUS Roxb. Fl. Ind. iii, (1832), 777; Mart. Hist. Nat. Palm. iii, 210 (first edit. and excl. fig. IV, 1 in pl. 116) and 339; Griff. in Calc. Journ. Nat. Hist. v, 61 and Palms Brit India, 71; Kunth, Enum. Pl. iii, 209; Walp. Ann. iii, 489 and 831; Hook. f. and Becc. in Hook. f. Fl. Brit. Ind. vi, 462; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—"Scandent. Leaves flagelliferous; leaflets alternate, remote, equidistant, narrow-lanceolar. Spines in belts, slender. Berries sphaerical." (Roxburgh l. c.)

HABITAT.—"Den-gullar, the vernacular name in Silhet, where it is indigenous, and is of great extent, say two or three hundred yards; when cleaned, toward the base, it is not thicker than a man's fore-finger, but as thick as the wrist toward the apex. The length of the joint is from six to twelve inches." (Roxburgh l. c.)

OBSERVATIONS.—The above is all that Roxburgh has written about this species. Apparently when Roxburgh speaks of leaves flagelliferous, we must understand that the leaves are prolonged beyond the leaflets into a cirrus, while when the flagelli are on the leaf-sheaths, as in *C. Rotang*, *fasciculatus* and *tenuis*, he uses the term "sheath flagelliferous." Now amongst the *Calamus* (including *Daemonorops*) of Silhet which have cirriferous leaves and are high scandent and with a sphaeric fruit I know only *Daemonorops Jenkinsianus*. I have elsewhere pointed out that the length of 200–300 yards attributed by Roxburgh to a *Calamus* must be considered quite hyperbolic.

6. CALAMUS GRAMINOSUS Bl. Rumphia, iii, 31 (2); Mart. Hist. Nat. Palm iii, 342; Walp. Ann. iii, 491 and v, 832; Miq. Fl. Ind. Bat. iii, 138 and De Palmis Arch. Ind. 29; H. Wendl. in Kerch. Les Palm. 236; Becc. Malesia, i, 88.

Palmijuncus graminosus Rumph. Herb. Amb. v, 104; Hassk. Neuer Schl. zu Rumph's Herb. Amb., 100 (excl. many syn.).

HABITAT.—Amboina, where it receives the Malay name of "Rottan Alea" and the Amboinese one of "Ua Laun Sehi."

OBSERVATIONS.—Of this *Calamus*, barely recognisable, Rumph writes that it is a variety of *Palmijuncus albus* (*C. albus*) and that like this has the leaves produced into a clawed cirrus, but that the leaflets are smaller, 10–12 inches long and not quite as wide as a man's little finger, and that the leaf-sheaths are armed with white flexible scattered spines. Rumph adds that the meaning of the native names is the Rotang with leaves like those of the Ginger.

7. CALAMUS HUMILIS Roxb. Fl. Ind. iii, 773; Kunth, Enum. Plant. iii, 213; Mart. Hist. Nat. Palm. iii, 213 (first edit.) and 332; Walp. Ann. iii, 483 and v, 829; Griff. in Calc. Journ. Nat. Hist. v, 35 and Palms Brit. India, 43; Kurz in Journ. Asiat. Soc. Beng. xliii, 2 (1874), 215; Hook. f. and Becc. in Hook. f. Fl. Brit. Ind. vi, 462; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—"Shrubby, not scandent nor flagelliferous. Leaflets lanceolar, smooth, many-nerved. Spines few, but long and strong (Roxb. l. c.).

HABITAT.—"A native of Chittagong (Roxb. l. c.)."

OBSERVATIONS.—Griffith states (Palms Brit. Ind. 34) that he has been unable to identify this *Calamus*, which is considered by him (l. c. 43) as referable to a species of the group of *C. erectus*. I feel, however, inclined to consider *C. humilis* as the young and not yet fertile plant of *C. latifolius*, which is also a native of Chittagong.—See observations under *C. latifolius*.

8. CALAMUS MARITIMUS Bl. Rumphia iii, 31 (note); Mart. Hist. Nat. Palm. iii, 343; Miq. Fl. Ind. Bat. iii, 139 and De Palmis Arch. Ind. p. 29.

Rotang Tsjavoni in insulis ante Bataviam crassissimum Rumph, Herb. Amb. v. 111.

OBSERVATIONS.—The name *C. maritimus* was assigned by Blume to the *Rotang Tsjavoni* of Rumph, but certainly this is a well-known Javan species, already described under its proper name, which is not recognizable from the vague characters assigned to it by the author of the "Herbarium Amboinense."

9. CALAMUS MICRANTHUS Bl. Rumphia, iii, 33, pl. 151; Mart. Hist. Nat. Palm. iii, 336; Walp. Ann. iii, 486 and v, 831; Miq. Fl. Ind. Bat. iii, 124 and Prodr. Fl. Sum. 256 and in Journ. de Bot. Néerl. i. 21 and De Palm. Arch. Ind. 27; Teysm. Cat. Hort. Bog. 75; Becc. in Rec. Bot. Surv. Ind. ii, 218.

HABITAT.—In marshy places in the interior of Sumatra collected by Praetorius (Blume).

OBSERVATIONS.—I have seen some portions of the specimens of which Blume made use for the description of this species and for plate 151 of his "Rumphia." From careful examination of this material I have come to the conclusion that *C. micranthus* was founded on a male spadix with very young flowers apparently of *C. Reinwardtii*, or of a species allied to it, and on the leaves of *C. Scipionum*. The leaflets attributed to *C. micranthus* are distinctly 5–7-costulate, and it would be an extraordinary fact if these were those of a plant which produces a spadix very similar to that of *C. Reinwardtii*, the species of the group to which this belongs having always 3-costulate leaflets.—See observations under *C. Scipionum*.

10. CALAMUS PENICILLATUS Roxb. Fl. Ind. iii, 781 (printed *pencillatus*); Mart. Hist. Nat. Palm. iii, 210 (first edit.); Griff. in Calc. Journ. Nat. Hist. v, 56 and Palms Brit. India, 66; Miq. Fl. Ind. Bat. iii, 209; Walp. Ann. iii, 484 and v, 830; Hook. f. and Becc. in Hook. f. Fl. Brit. Ind. vi, 462; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—"Scandent. *Leaflets* thirty-four pair, regularly alternate except the terminal two, which are united, lanceolate, seven to nine-nerved; margins entire and smooth, a pencil of bristles from the apex of each. *Sheaths* flagelliferous. (Roxburgh l. c.)

HABITAT.—"Found by Mr. Roxburgh in the forests of Pulo Pinang running over trees. It is more slender than the common rattan, and less so than the next species, *C. gracilis* (Roxburgh l. c.)."

OBSERVATIONS.—I have reproduced above all that Roxburgh has written about this species of which no authentic specimens are known. As I have already said in the observations under *C. javensis peninsularis*, if for "thirty-four pairs of leaflets" in Roxburgh's description 3-4 be substituted, this might apply to it, and therefore the name of *C. javensis* ought to be replaced by that of *penicillatus*, this having been proposed a few years before (1832).

11. CALAMUS PETRAEUS Lour. Fl. Cochinch. edit. 1, i, 209; Lam. Encycl. vi, 303 (excl. syn.); Spreng. Syst. ii, 17 (excl. *C. Rotang* Willd.); Kunth, Enum. Pl. iii, 206; Mart. Hist. Nat. Palm. iii, 208 (edit. 1) et 342; Griff. in Calc. Journ. Nat. Hist. v, 44; Walp. Ann. iii, 342 and v, 832; H. Wendl. in Kerch. Les Palm. 237.

OBSERVATIONS.—On account of the spadix which is said to be terminal and very long it cannot be a species of *Calamus*; probably it is a *Korthalsia* or a *Plectocomia*.

12. CALAMUS POLYGAMUS Roxb. Fl. Ind. iii, 780 (1832); Mart. Hist. Nat. Palm. iii, 210 (first edit.) and 337; Griff. in Calc. Journ. Nat. Hist v, 48 and Palms Brit. India, 58; Kunth, Enum. Pl. iii, 209; Walp. Ann. iii, 487 and v, 831; Hook. f. and Becc. in Hook. f. Fl. Brit. Ind. vi, 462; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—"Scandent. *Spines* sub-verticilled. Sheaths flagelliferous. *Inferior leaflets* in remote fascicles of three or four, above single and alternate, or opposite, all linear, with a few bristles on the margins and nerves underneath. *Male* and *hermaphrodite flowers* on the same supra-decompound spadix." (Roxburgh l. c.)

HABITAT.—"Hoodoom Bet of the people of Chittagong, where it is indigenous and a most extensive rambler: the general thickness when cleaned is that of a stout walking cane. Its growth is exceedingly slow, for in ten years it had acquired a stem of only five feet in length, and the leaves from ten to twelve more." (Roxburgh l. c.)

OBSERVATIONS.—I have not seen Roxburgh's specimen of this species of which that author has left only the meagre description reproduced above. I am, however, inclined to identify it with *C. Flagellum* Griff. If this could be proved, the specific name of *polygamus*, though an improper one, as all *Calamus* on superficial examination appear polygamus, ought to have precedence over that of *Flagellum*, this having been proposed many years later than the other.

13. **CALAMUS PULCHER** Miq. Anal. Bot. Ind. i, 3 and Fl. Ind. Bat. iii, 120 and De Palmis, 27; H. Wendl. in Kerch. Les Palm. 237; Becc. in Rec. Bot. Surv. Ind. ii, 217.

DESCRIPTION.—Scandent or standing? *Sheathed stem* 3–6 cm. in diam. (1–2 in. Miquel . *Leaf-sheaths* flagelliferous, thick, pale, striate, glabrous, obliquely truncate and sparsely hairy at the mouth, strongly armed with straight, subulate, usually more or less confluent and whorled, brown-yellowish or chestnut-brown spines, of which the largest about 3 cm. long, these intermingled with much smaller ones. *Leaves* subcirriferous; petiole short, 16–22 cm. long (6–8 in. Miquel), and about 14 mm. thick (5 in. Miquel), rounded and strongly spinous below, especially at the margins; the pinniferous part 1–1·3 m. long; rachis in its upper portion acutely bifaced above, round beneath where armed with deflexed solitary or more often 3-nate prickles of which in this last case the mesial very long; leaflets numerous (about 50 on each side) inequidistant and fascicled in groups of 5–6 (on each side of the rachis?, Beccari), linear-lanceolate, acute, all similar, 16–22 or at most 24 cm. long (6–8 or 9 in. Miquel), and 11–14 mm. wide (5–6 lines Miquel), shining above, uni- or subtricostate with the mid-costa acute and furnished with erecto-patent, brown, bristly spinules, the side costae more slender and sparingly spinulous; margins spinulous-serrate; in some very adult leaves the leaflets are more rigid and subseptemnervous; apical leaflet, narrower than the others, a few inches long, aculeolate. *Leaf-sheaths flagella* inserted near the mouth of the sheath, very long, armed with very acute black-tipped ternate claw. *Spadix* (*male?*, Beccari), very long, with 5–6 partial inflorescences; these bearing 5–10 alternate spikelets; primary spathes rather loosely sheathing, with tubular, somewhat flattened, lanceolate limb; secondary spathes tubular, short, striate; spikelets 5·5–8 cm. long; spathels striately veined, asymmetrically infundibuliform; involucre (spathellule, Miquel), cupular, bidentate. *Flowers* (*male*, Beccari) rather remote, conic when in bud; calyx 3-toothed; corolla divided into 3 elongate narrow segments. (Description from Miquel, l. c.)

HABITAT.—South Borneo (Miquel).

OBSERVATIONS.—I have seen no specimens of this. I do not know any other *Calamus* with long flagelli at the sheaths and the leaves subcirriferous at the summit, and at the same time with fascicled narrow sub-3-costate leaflets. The combined character of the linear-lanceolate fascicled leaflets with the rachis armed beneath with ternate deflexed spines, of which that of the centre is long, is peculiar to *C. viminalis*; but in this the leaves are not subcirriferous at their summit. The stem also is apparently described as being erect, about as high as a man, but a full-grown species of *Calamus* with standing stem and at the same time with flagelliferous leaf-sheaths is not yet known. For these reasons I consider *C. pulcher* as a doubtful species, probably founded upon heterogeneous elements.

14. **CALAMUS QUINQUENERVIUS** Roxb. Fl. Ind. iii, 777; Kunth, Enum. Pl. iii, 209; Mart. Hist. Nat. Palm. iii, 210 (first edit.) and 339; Walp. Ann. 489, iii, and v, 831; Griff. in Calc. Journ. Nat. Hist. v, 61, and Palms Brit. Ind. 72; Hook. f. Fl. Brit. Ind. vi, 460; Becc. in Rec. Bot. Surv. Ind. ii, 215.

Description.—"Scandent. *Leaves* flagelliferous (= cirriferous, Beccari); leaflets few, remote, equidistant, lanceolar, five-nerved. Spines distinct, few, short and strong; spadix decompound." (Roxburgh l. c.)

Habitat.—India, in Silhet. "Hurnur-gullar, the vernacular name in Silhet, where this species is found running over trees to a great extent; the rattan when cleaned is about as thick as a man's finger throughout, and the joints from six to eight inches long." (Roxburgh l. c.)

Observations.—Probably under the name of *C. quinquenervius* lurks a very well-known species, not easy to recognize in the short description given by its author. Of the species of *Calamus* growing in the country surrounding Silhet I know only *C. nambariensis* with cirriferous leaves and relatively broad 5-costate equidistant leaflets; all the other species with 5-costate leaflets having these more or less approximate in pairs on each side of the rachis. Some forms of *C. palustris* (v. *amplissimus* for instance) have subequidistant leaflets, but I have not seen representatives of this species collected in Silhet.

15. Calamus verus Blanco, Fl. de Filip. (first edit.) i, 210 (excl. syn. Rumph.).

Observations.—Apparently a species of *Daemonorops*, certainly different from the *Palmijuncus verus angustifolius* of Rumph., which seems to me a true *Calamus* (*C. Rumphii* Bl.).

16. Calamus viminalis var. repens Bl. Rumphia, iii, 31 (note 6); Mart. Hist. Nat. Palm. iii, 336 (with *C. buroensis*); Miq. Fl. Ind. Bot. iii, 122; Kunth, Enum. Pl. iii, 205.

Palmijuncus viminalis ambulans Rumph Herb. Amb., v, 109.

Habitat.—Buru in the Moluccas and the not distant small islands of Kelang and Bonoa. In Bonoa it received the name of "Ua Wuay" according to Rumph.

Observations.—Probably it is a species very distinct, but not recognisable in the very short and vague description left by Rumph. I do not see any reason for considering it to be a variety of *C. viminalis*.

DESCRIPTION OF PLATE I.

(*All figures enlarged 6 diam.*)

Fig. 1.—(This and the following 8 figures represent analyses of *C. erectus.*) Portion of a male spikelet with asymmetrically infundibuliform spathels (*k*) and cupular involucres (*b*); these inserted inside their own spathel at the base of the one above.

Fig. 2.—Portion of a male spikelet cut longitudinally, the involucres (*b*) are half immersed in the spathels (*k*); in the upper part is the calyx (*d*) of two flowers still attached to their involucre.

Fig. 3.—Outline of fig. 2 showing the relative position of spathels (*k*) and involucre (*b*); the dotted line completes that portion of the margin of the spathel not seen in fig. 2.

Fig. 4.—An entire male flower (full-grown bud) with calyx and corolla.

Fig. 5.—The corolla alone, from a male flower.

Fig. 6.—Petal of a male flower with 3 stamens and the abortive ovarium (*n*) standing up in their midst.

Fig. 7.—A detached stamen from an unexpanded flower.

Fig. 8.—Portion of a female spikelet stripped of its flowers and showing the cupular involucre (*b*) which has two superficial teeth (separated by a slightly excavate sinus) on the outer side, namely on that corresponding to the areola of the neuter flower (*c*); with its scar (*h*); the two teeth of the involucre correspond to the horns of the lunate areola.

Fig. 9.—Longitudinal section of a portion of a female spikelet; it shows the relative position of the spathel (*k*), of the involucrophorum (*a*) and of the involucre (*b*).

Fig. 10.—Portion of a female spikelet of *C. Flagellum* before the expansion of the flowers. At the mouth of the upper spathel (*k*) is a female flower (*d e*) accompanied by its neuter flower (*f*); the female flower is enveloped at its base by the involucre (*b*), and more externally by the involucrophorum (*a*); the lower female flower is without its companion or neuter flower which was attached in (*h*) on the lunate areola (*c*).

Fig. 11.—Portion of a female spikelet of *C. Scipionum* stripped of its flowers; the involucrophora (*a*) are short, subcupuliform, attached almost outside their own spathel (*k*) at the base of the one above; the involucre (*b*) is shallow and subdiscoid, slightly bidentate and excavate on the outer margin; the areola of the neuter flower (*c*) is depressedly lunate with a very distinct scar (*h*) where was inserted the neuter flower.

Fig. 12.—Longitudinal section of the above showing the relative position of the involucrophora (*a*), involucre (*b*) and spathels (*k*).

DESCRIPTION OF PLATE II.

(*Fig. 1 enlarged about 2 diam., all the others 6 diam.*)

Fig. 1.—Portion of a spikelet of *C. unifarius* var. *Pentong.* The involucrophorum (*a*) is inserted laterally on the spathel above its own and just outside the mouth of this (*k*): it is pedicelliform with a small limb, and is furnished at its base with a very conspicuous axillary callus (*i*) and a distinct transversal (apparently nectariflous) rima; the involucre (*b*) is almots

flat and discoid; the areola of the neuter flower (*c*) is represented by a small tubercle; the fruiting perianth (*o*) is pedicelliform.

Fig. 2.—Portion of a female partial inflorescence of *C. Zollingerii*, with the basal part of the spikelets bearing ovaries in course of development; the secondary spathes (*m*) are cut open on their anterior part to show the insertion of the spikelets to the bottom of their respective spathes by means of a distinct pedicellar part (*l*).

Fig. 3.—Portion of a fruiting spikelet of *C. didymocarpus* stripped of its fruits; in its upper part is the insertion of two geminate fruits, which have a single involucrophorum (*a*) and two shallowly cupular involucres (*b*); these united by their inner sides and with the trace of an areola (*c*) for the reception of the neuter flower in the midst; in the lower part of the figure is the insertion of a fruit, solitary as in most species, with the involucrophorum (*a*) as above, the involucre (*b*) cupular furnished externally with a very distinct areola (*c*) and this marked by a conspicuous scar (*h*) where was attached the neuter flower; in both cases the involucrophorum is inserted laterally at the base of the spathel above its own and is conspicuously bidentate above on the side next to the axis.

Fig. 4.—(This and the following figures belong to *C. Griffithianus.*) Portion of a male spikelet with broadly infundibular spathels (*k*), each spathel bearing attached to its bottom a subpedicellate involucrophorum (*b*).

Fig. 5.—Male flower open showing the stamens coalescent at their base with the corolla, and the central abortive ovarium (*n*).

Fig. 6.—Female flower during anthesis with a spathaceous subpedicellate involucrophorum (*a*), the involucre (*b*) with the neuter flower (*f*) in its areola; this seen in profile.

Fig. 7.—Another female flower with its involucres during anthesis.

Fig. 8.—Female flower with its involucre still closed, with a front view of the ovate acute concave and sharply bordered areola (*c*).

Fig. 9.—The same flower as fig. 8; back view of the involucrophorum (*a*); this flat and acutely two-keeled on the side next to the axis.

Fig. 10.—Female flower, divested of its involucre, with calyx (*d*) and corolla (*e*).

Fig. 11.—Female flower cut open, to which has been carried the calyx and a portion of the corolla; it shows the internal staminal tube (*g*) which envelopes the ovary and the abortive erect sagittate anthers.

Fig. 12.—Neuter flower with calyx and corolla and six stamens; these have subulate filament inflected at their apex and bear effete anthers; in the centre is the rudimentary ovary (*n*).

N.B.—In both plates the letters indicate the same organs as follow:—

(*a*)	Involucrophorum,
(*b*)	Involucre,
(*c*)	Areola of the neuter flower,
(*d*)	Calyx,
(*e*)	Corolla,
(*de*)	Female flower,
(*f*)	Neuter flower,
(*g*)	Staminal urceolum of the female flower,
(*h*)	The scar or point of insertion of the neuter flower,
(*i*)	Axillary callus with transversal rima,
(*k*)	Spathels,
(*l*)	Peduncular part of the spikelet,
(*m*)	Secondary spathes,
(*n*)	Abortive ovary,
(*o*)	Fruiting peranth.

"Nomina nuda," excluded and Horticultural species of "Calamus."

Calamus acanthopis Griff. = *Daemonorops malaccensis* Mart.

Calamus accedens Miq. = *Daemonorops ruber* Bl.

Calamus accedens *var.* brevispatha H. Wendl. = *Daemonorops gracilipes* Becc.

Calamus africanus Linden ex O. Kunze, Rev. Gen. Pl. 733. Quid?

Calamus Alberti Hort. Sand.; Rev. Hort. 1898, 262; Nichols. and Mottet, Dict. Prat. d'Hort. v. Suppl. 730. Océanie. Quid?

Calamus amboinensis Miq. = *Daemonorops calapparius* Bl.

Calamus americanus Hort. ex Steud. ed. 2, ii. 252. = *Desmoncus americanus* Steud.

Calamus angustifolius Griff. = *Daemonorops angustifolius* Mart.

Calamus assamicus, Linden, Illustr. Hort. xxiii (1881) 16. (Name only.) Assam.

Calamus Ashyanus Dallière ex O. Kunze, Rev. Gen. Pl. 733. Quid?

Calamus calapparius Mart. = *Daemonorops calapparius* Bl.

Calamus calicarpus Griff. = *Daemonorops calicarpus* Mart.

Calamus Caroli Hort. Sand.; Rev. Hort. 1898, 262; Nichols. and Mottet, Dict. Prat. d'Hort. v. Suppl. 730. East India. Quid?

Calamus cinnamomeus Hort. Lind.

I have seen of this a leaf of a young plant in Herb. Kew. In the Botanic Garden of Buitenzorg this name is applied to a species of *Daemonorops*.

Calamus cochinchinensis Hort. Lind.; Rep. Roy. Gard. Kew, 1882 (1884), 67, Quid?

Calamus cochleatus Miq. = *Daemonorops cochleatus* Teysm. and Binn.

Calamus coronarius Mackoy ex O. Kunze, Rev. Gen. Pl. 733. Quid?

Calamus crinitus Miq. = *Daemonorops crinitus* Bl.

Calamus cuspidatus Mann and Wendl. in Trans. Linn. Soc. xxiv. 434. = *Eremospatha cuspidata* (M. and W.).

Calamus dealbatus Hort.; H. Wendl. in Kerch. Les Palm. 236. = *Acanthophoenix rubra* Wendl.

Calamus densus Williams ex O. Kunze, Rev. Gen. Pl. 733. Quid?

Calamus depressiusculus Teysm. and Binn. = *Daemonorops depressiusculus* Becc.

Calamus Draco Willd. = *Daemonorops Draco* Bl.

Calamus Draco (not of Willd.) Griff. = *Daemonorops propinquus* Becc.

Calamus elegans Hort. ex H. Wendl. in Kerch. Les Palm., 236. Quid?

CALAMUS ELONGATUS Miq. = *Daemonorops elongatus* Bl.

CALAMUS EXTENSUS Roxb. = *Daemonorops Jenkinsianus* Mart.?

CALAMUS FARINOSUS Hort. Lind.; E. André in Illustr. Hort. 1872, 336, pl. CIX; Rep. Roy. Gard. Kew, 1882 (1884), 67.

This is said to be a native of Sumatra. The plate represents a very young plant with white mealy petioles. Apparently a species of *Daemonorops.*

CALAMUS FISSUS Miq. = *Daemonorops fissus* Bl.

CALAMUS GAUDICHAUDII H. Wendl. = *Daemonorops Gaudichaudii* Mart.

CALAMUS GEMINIFLORUS Griff. = *Plectocomiopsis geminiflorus* Becc.

CALAMUS GENICULATUS Griff. = *Daemonorops geniculatus* Mart.

CALAMUS GLAUCESCENS D. Dietr. Syn. Pl. ii. 1064 = *Ceratolobus glaucescens* Bl.

CALAMUS GRACILIPES Miq. = *Daemonorops gracilipes* Becc.

CALAMUS GRANDIFLORUS Palis. de Beauv. ex Steud. Nom. Bot. 252 (name only). Sierra Leone = *Ancistrophyllum secundiflorum* Mann and Wendl.?

CALAMUS GRANDIS Griff. = *Daemonorops grandis* Mart.

CALAMUS GRANDIS (not of Griff.) Kurz. = *Daemonorops Kurzianus* Becc.

CALAMUS GRANDIS Hort. ex Illustr. Hort. (1895), 223; Index Kew. suppl. prim. Borneo? Quid?

CALAMUS GUINEENSIS Hort.; Nichols. and Mottet, Dict. Prat. d'Hort. i. 450. Sikkim (sic!). Quid?

CALAMUS HIRSUTUS Miq. = *Daemonorops Hystrix* Mart.

CALAMUS HOOKERII Mann and Wendl. in Trans. Linn. Soc. xxiv. p. 434 = *Eremospatha Hookerii* M. and W.

CALAMUS HYGROPHILUS Griff. = *Daemonorops hygrophilus* Mart.

CALAMUS HYSTRIX Griff. = *Daemonorops Hystrix* Mart.

CALAMUS IMPERATRICE MARIE Hort.; H. Wendl. in Kerch. Les Palm. 236. Quid?

CALAMUS INTERMEDIUS Griff. = *Daemonorops intermedius* Mart.

CALAMUS JENKINSIANUS Griff. = *Daemonorops Jenkinsianus* Mart.

CALAMUS KENTIAEFORMIS Hort.; Cat. de la Comp. Cont. d'Hort. 1884, 3; Nichols. and Mottet, Dict. Prat. d'Hort. i. 450. Quid?

CALAMUS KORTHALSII Miq. = *Daemonorops Korthalsii* Bl.

CALAMUS LAEVIGATUS Mart. = *Ceratolobus laevigatus* Becc.

CALAMUS LAEVIS Mann and Wendl. in Trans. Linn. Soc. xxiv. 430 = *Ancistrophyllum laeve* M. and W.

CALAMUS LATISPINUS Teysm. and Binn. in Cat. Pl. Hort. Bot. Bogor. (1866), 74. *C.* (Sect. *Daemonorops*) *latispinus* Miq. De Palm. Arch. Ind. 29.

In the Province of Palembang in Sumatra. I have not seen a description of this, and apparently it is no longer cultivated at Buitenzorg under this name.

CALAMUS LATISPINUS Hort.; H. Wendl. Index Palm. 8.

In Herb. Kew I have seen leaves of a young plant cultivated under this name; these apparently belong to *C. erectus.*

CALAMUS LAUCHEANUS Hort. Sand.; Rev. Hort. 1898, 262; Nichols. and Mottet, Dict. Prat. d'Hortic. v. Suppl., 730. Sarawak. Quid?

CALAMUS LEPTOPUS Griff. = *Daemonorops leptopus* Mart.

CALAMUS LEWISIANUS Griff. = *Daemonorops Lewisianus* Mart.

CALAMUS LONGIPES Griff. = *Daemonorops longipes* Mart.

CALAMUS MACROCARPUS Mann and Wendl. in Trans. Linn. Soc. xxiv. 435. = *Eremospatha macrocarpa* M. and W.

CALAMUS MACROPTERUS Miq. = *Daemonorops macropterus* Becc.

CALAMUS MAXIUMS (not of Blanco) Reinwardt in Bl. Cat. Hort. Bog. 59 (non vidi) = *Plectocomia elongata* Bl.

CALAMUS MANICATUS Teysm. and Binn. = *Daemonorops crinitus* Bl.

CALAMUS MANNII Wendl. in Trans. Linn. Soc. xxiv. 436 = *Oncocalamus Mannii* Wendl.

CALAMUS MARGARITAE Hance = *Daemonorops Margaritae* Hance.

CALAMUS MELANOCHAETES Miq. = *Daemonorops melanochaetes* Bl.

CALAMUS MICRACANTHUS Griff. = *Daemonorops micracanthus* Becc.

CALAMUS MIRABILIS Mart. = *Daemonorops mirabilis* Mart.

CALAMUS MOLLIS (not of Blanco) Vidal = *Daemonorops Gaudichaudii* Mart.

CALAMUS MONTICOLUS Griff. = *Daemonorops monticolus* Mart.

CALAMUS NEWMANNI Hort. Angl. ex Steud. Nom. Bot. 525. Madagascar. Quid?

CALAMUS NICOLAI Hort. Rollins.; H. Wendl. in Kerch. Les Palm., 237; Rep. Roy. Gard. Kew, 1882 (1884), 67.

CALAMUS NIGER Willd. = *Daemonorops niger* Bl.

CALAMUS NITIDUS Hort. Linden.

I have seen of this a leaf from a young plant in Herb. Kew. Certainly it is not *C. nitidus* of Martius.

CALAMUS NUTANTIFLORUS Griff. = *Daemonorops Jenkinsianus* Mart.

CALAMUS OBLONGUS Reinw. = *Daemonorops oblongus* Bl.

CALAMUS OCHREATUS (*Daemonorops* Teysm. and Binn.) Miq. De Palm. 29. Name only. The plant cultivated at Buitenzorg under the name of *Daemonorops ochreatus* Teysm. and Binn., and coming from Palembang in Sumatra, is *Korthalsia echinometra* Becc.

Calamus opacus (not of Bl.) Mann and Wendl. in Trans. Linn. Soc. xxiv. 431 = *Laccosperma opacum* M. and W.

Calamus palembanicus Miq. = *Daemonorops palembanicus* Bl.

Calamus pallidus Bl. ex Miq. De Palm. Arch. Ind. 28. Perhaps a slip for *C. pallens* Bl.?

Calamus paniculatus Roxb. Hort. Beng. 105, nomen. Penang; ex. Ind. Kew.

Calamus paradoxus Kurz. = *Plectocomiopsis paradoxus* Becc.

Calamus parvifolius Roxb. Roxburgh never published a *Calamus* with this name, used by Vidal Pl. Cum., 154. = *C. Blancoi* Kunth.

Calamus patanensis Hort.; Rev. Hort. 1883, 206. Name only. Quid?

Calamus periacanthus Miq. = *Daemonorops periacanthus* Miq.

Calamus petiolaris Griff. = *Daemonorops petiolaris* Mart.

Calamus peticlaris var. β Griff. = *Daemonorops petiolaris* var. *nudipes* Becc.

Calamus philippensis Linden. Ilustr. Hort. xxviii (1881), 16 (name only). Philippine Is. Quid?

Calamus platyacanthus Kunth = *Daemonorops platyacanthus* Mart.

Calamus plumosus Van Houtte ex O. Kunze, Rev. Gen. Pl., 733. Quid?

Calamus reflexus Lindl. (or Linden?) ex O. Kunze, Rev. Gen. Pl., 733 Quid?

Calamus refractus Linden ex O. Kunze, Rev. Gen. Pl., 733. Quid?

Calamus regis Linden, Cat. de la Comp. Cont. d'Hortic. No. 119 (1886-1887); 8; Nichols. and Mottet, Dict. Prat. d'Hort. i. 450.

It is said that it was discovered by Aug. Linden in Papuasia. Quid?

Calamus Regis Daniæ Kamphoev. ex Rink, Nicob. Is., 132. Name only. Nicobar Is. Quid?

Calamus Riedelianus Miq. = *Daemonorops Riedelianus* Becc.

Calamus Rotang Linn. (partly) = *Daemonorops Calapparius* Bl.

Calamus Rotang (non Linn.) Gaertn. = *Daemonorops ruber* Bl. (as from Bl.).

Calamus ruber Reinw. = *Dæmonorops ruber* Bl.

Calamus Rungdung Mackoy ex O. Kunze, Rev. Gen. Pl., 733. Quid?

Calamus ruptilis H. Wendl. = *Daemonorops ruptilis* Becc.

Calamus Salacca Willd. ex Steud. Nom. Bot. ed. 2, i. 252 = *Zalacca edulis* (*vide* Index Kew., Suppl. I).

Calamus secundiflorus Pal. de Beauv. = *Ancistrophyllum secundiflorum* M. and W.

Calamus stoloniferus Teysm. and Binn. in Cat. Hort. Bog. 1866, 75 (name only); Miq. de Palm. Arch. Ind. 29; Becc. in Rec. Bot. Surv. Ind. ii. 218.

I do not know a description of this. From the Botanic Garden of Buitenzorg I have received specimens of *C. horrens* Bl. from a plant cultivated there under the name of *C. stoloniferus.*

CALAMUS STRICTUS Miq. = *Daemonorops longipes* Mart.

CALAMUS TRIANGULARIS Becc. = *Myrialepis triangularis* Becc.

CALAMUS TRICHROUS Miq. = *Daemonorops trichrous* Miq.

CALAMUS TRINERVIS Hort. Rollins.; Nichols. and Mottet, Dict. Prat. d'Hort. i. 450.

This has flowered at Kew, and a specimen of it preserved in that Herbarium has proved to be *C. javensis* Bl.

CALAMUS TRIQUETER Becc. = *Myrialepis triqueter* Becc.

CALAMUS USITATUS Blanco. = *Daemonorops Gaudichaudii* Mart.

CALAMUS USITATUS (not of Blanco) Vidal Fl. For. de Filipinas, pl. XCIII, figs. 1 and 4.

Figure 2 of the plate seemingly represents a portion of the male inflorescence of *C. mollis* and No. 3 a male flower of it; but the portion of a fruiting spadix represented in fig. 4 is that of a species unknown to me.

CALAMUS VEITCHII Linden ex O. Kunze, Rev. Gen. Pl., 734. Quid?

CALAMUS VERTICILLARIS Griff. = *Daemonorops verticillaris* Mart.

CALAMUS VERSCHAFFELTII Hort.; H. Wendl. in Kerch. Les Palm., 238. = *Acanthophœnix crinita* Wendl.

CALAMUS ZALACCA Gærtn. Fruct. ii. 267, t. 139 = *Zalacca edulis* Reinw. ex H. Wendl. in Kerch. Les Palm., 238.

CALAMUS ZALACCA Roxb. Hort. Beng. 72 and Fl. Ind. iii, 773. = *Zalacca Wallichiana* Mart. ex H. Wendl. in Kerch. Les Palm., 238.

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New species are in bold type.

[Synonyms and "nomina nuda" are in italics.]

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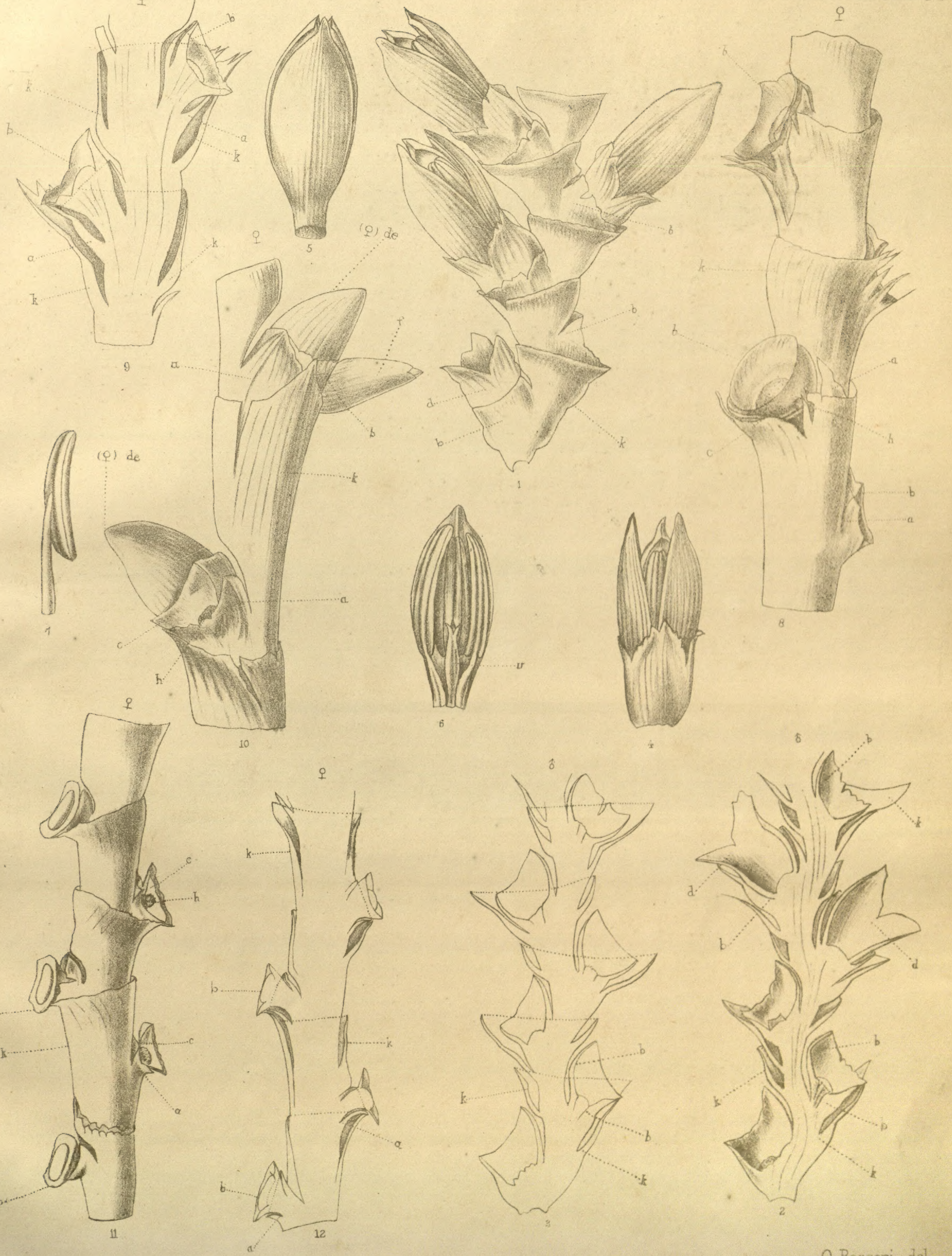
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FIG. 1-9. CALAMUS ERECTUS-FIG. 10. C. FLAGELLUM-FIG. 11-12. C. SCIPIONUM.

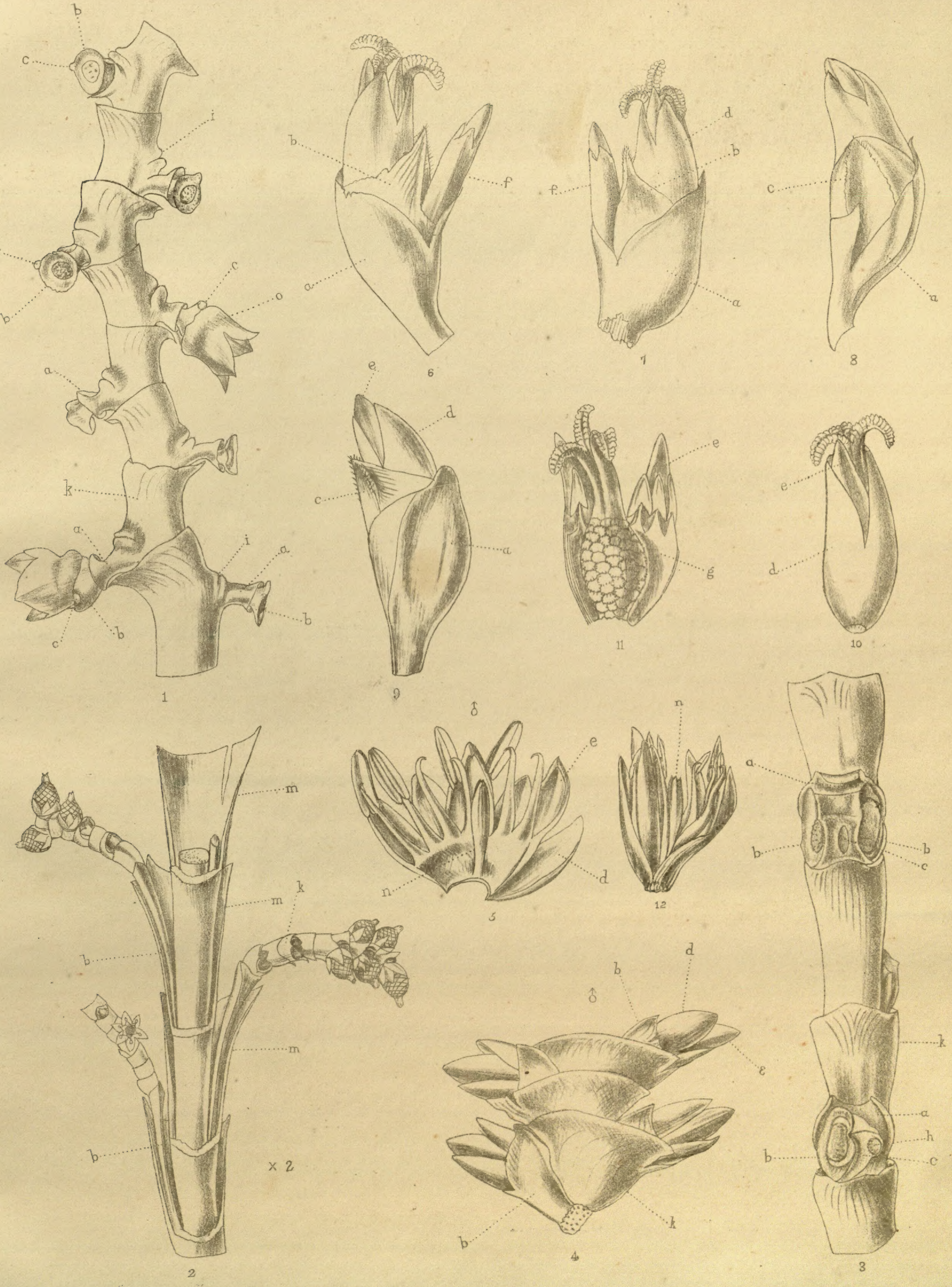
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FIG. 1. C. UNIFARIUS v. PENTONG—FIG. 2, CALAMUS ZOLLINGERII—FIG. 3, C. DIDYMOCARPUS
FIG. 4—12, C. GRIFFITHIANUS.